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REPORT

SOIL VAPOR EXTRACTION (SVE) FINAL REMEDY CONSENT DECREE FINAL EXTRACTION AND TREATMENT SYSTEM DESIGN - POLYGON 84

PHOENIX-GOODYEAR AIRPORT (SOUTH) SUPERFUND SITE, GOODYEAR, ARIZONA

Submitted to:

The Goodyear Tire and Rubber Company
1144 East Market Street
Akron, Ohio

March 25, 1994

M&E

Metcalf & Eddy, Inc.
450 B Street, Suite 1900
San Diego, California 92101

M&E Metcalf & Eddy
An Air & Water Technologies Company

May 13, 1994

Mr. Craig Cooper
U.S. EPA H-7-2
75 Hawthorne Street
San Francisco, California 94105

Subject: Response to U.S. EPA Comments
SVE Final Design-Polygon 84
Phoenix-Goodyear Airport Site
Goodyear, Arizona

Dear Mr. Cooper:

Enclosed, please find the response to U.S. EPA comments for the Polygon 84 Soil Vapor Extraction (SVE) Final Design. This transmittal is submitted on behalf of The Goodyear Tire & Rubber Company in accordance with the Consent Decree (Section VII, Subsection D-15).

This letter, the response to comments, and the corrected portions of the document take into account the written U.S.EPA comments dated May 7, 1994 (attached) as well as concerns discussed in a teleconference between Goodyear, U.S.EPA, ADEQ, M&E, Sharp, and URS on May 10, 1994.

The primary U.S.EPA concern is that of Polygon 84 treatment coverage using the three specified fully-penetrating extraction wells. This design is feasible since operational data from Polygon 79 as well as pilot test data from the 1987 RI/FS (Appendix S) pilot test indicate that the proposed number and configuration of wells will be able to accomplish the Polygon 84 remediation goals within the same time period. The primary factor that will govern treatment coverage is establishing the extraction flow rate and vacuum per well to gain full polygon coverage. The existing treatment system has sufficient capacity to accomplish these goals and the operational parameters necessary to achieve coverage will be outlined in the O&M manual and will be developed during start-up.

In accordance with Consent Decree item D-12, a draft Operations and Maintenance (O&M) manual will be submitted to U.S.EPA thirty (30) days prior to start up. The draft O&M manual will consist of an addendum to the existing U.S.EPA-approved Polygon 79 November 5, 1993 SVE O&M manual and will be specific to Polygon 84 operations and monitoring. The O&M manual addendum will focus on two primary issues, extraction well operations to achieve full polygon treatment coverage, and modification of soil vapor screening concentrations for the Polygon 84-specific VLEACH parameters. A section will also be developed for Polygon 79/84 combined operation should it be needed.

An estimated project schedule for Polygon 84 has been provided in section six of the document.

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Goodyear anticipates commencement of construction activities on May 16, 1994 and M&E will formally notify U.S.EPA on behalf of Goodyear of all Consent Decree schedule milestones as they occur. Since SVE construction and operation within Polygon 84 will be ahead of the stipulated Consent Decree time table, Goodyear proposes to "bank" this time and utilize it in the future, if necessary for the design and construction of the upcoming three-polygon group 27A/92/96. This time may be necessary due to the combined design and potentially complex negotiations with the property owners and tenants, the City of Phoenix and Lufthansa respectively. A formal proposal on "bank" time will be submitted following start-up of Polygon 84. Each formal Consent Decree schedule milestone letter will indicate the commencement date as well as the number of days ahead of schedule the item is for banking.

Lastly, since the number of changes to the Polygon 84 Design are minimal, we have included in this package only the pages or sections that need updating in the document.

If you have any questions regarding this document or any other site issues, do not hesitate to contact myself at (619) 233-7855 or Mr. Mark Whitmore at (216) 796-3863.

Sincerely,

METCALF & EDDY, INC.

Scott P. Zachary
SVE Project Manager

Attachments:

1-Revised Sections of SVE Final Design-Polygon 84
2-Response to U.S.EPA Comments

cc: M. Whitmore, The Goodyear Tire & Rubber Company
L. Smith, URS Consultants
R. Bartholomew, Bartholomew Engineering
J. Kasarskis, Arizona Department of Environmental Quality
T. Struttmann, Sharp and Associates, Inc.
T. Heim, Loral Corporation
L. Reider, Metcalf & Eddy, Inc.

EPA513294.let

RESPONSE TO U.S.EPA COMMENTS

Soil Vapor Extraction (SVE) Final Remedy
Consent Decree Final Extraction and Treatment
System Design-Polygon 84

March 25, 1994

Phoenix-Goodyear Airport Site
Goodyear, Arizona

The following sections present formal responses to the U.S.EPA comments dated May 7, 1994 for the above referenced submittal. These comments fulfill the requirements under Section VII, Subsection D.10 of the Consent Decree.

Cover Letter-p. 1-Scheduling

Goodyear will inform U.S. EPA of the official date of construction commencement and Polygon 84 start up by letter (Consent Decree VII, D.12 and D.13 respectively) Goodyear will also submit the draft O&M manual for Polygon 84 30 days prior to Polygon 84 start up.

Cover Letter-p. 1-O&M Manual

The Polygon 79 O&M Manual will be modified in two ways for Polygon 84: 1-Modify extraction well operation to maintain the required design radius of influence (>184 feet), and 2-Adjust field soil vapor monitoring concentrations in the monitoring wells to account for Polygon 84 size and soil vapor distributions. These changes will be submitted as required (Consent Decree VII, D.14) as an addendum to the existing Polygon 79 O&M manual. No major revisions will be made.

Specific Comment 1-Well Construction/Configuration-Section 3.1

The Polygon 84 design utilizes fully-penetrating wells as opposed to the Polygon 79 dual completion wells. The fully-penetrating well was selected due to the contaminant distribution (bottom loaded) in Polygon 84, not requiring aggressive shallow vadose zone treatment. The fully-penetrating well will be able to accomplish the polygon remediation goals based on the operation of the Polygon 79 ("lower-coarse") lower vadose zone wells as well as the 1987 RI/FS pilot test fully-penetrating well. Attached is the Polygon 79 start-up and radius of influence data as well as a graphic illustration of the data.

These well configurations in Polygon 79 were able to establish the full design radius of influence as well as effectively treat both the upper-fine (0'-30' bgs) and the lower-coarse (30'-60' bgs) vadose zone. Supporting this conclusion is the operational data from Polygon 79 illustrating a radius of influence in excess of 184 feet at the standard extraction well operational flow rate of 120 scfm. Further supporting this is the 1987 RI/FS pilot test of a fully penetrating well. The treatment system has more than sufficient capacity to accommodate operation of the three proposed wells or additional wells, if required. Based on this data, the clean-up time of Polygon 84 should not be impacted. The change in the well construction will also allow for a simplified operation and maintenance protocol.

Specific Comment 2-Well Parameter Discrepancies-Table 3-1

Due to the fluctuation of the Subunit A groundwater table, the installation depth is variable. The drilling and construction criteria is to keep the boring/well a minimum of one (1) foot above the water table. This depth varies across the site from 50 to 60 feet below grade. The text has been corrected to reflect a consistent set of measurements.

The boring hole bottom seal will be constructed of 8-20 sieve bentonite. The text has been corrected to reflect these materials.

Specific Comment 3-Drawing 84-C-1, Radius of Influence

The 150-foot influence radius was selected conservatively based on Polygon 79 operational data. During start-up and operation at normal flow rates (100-120 scfm), the observed influence, defined as 0.25 to 0.5 inches of water vacuum net of ambient vadose zone pressures was in excess of 184 feet. Using this drawdown data, the Polygon 84 treatment coverage "gaps" are be eliminated, thus not requiring an additional extraction well. The O&M manual will be modified to operate the wells to ensure the appropriate radius of influence to gain Polygon 84 coverage.

Specific Comment 4-Appendix D, ADEQ Address

The ADEQ address change is noted and the text has been updated for this change.

General Comment 1-Radius of Influence

Comment noted. See response to Specific Comments 1 and 3 above.

General Comment 2-Page 16-Radius of Influence

Comment noted. See response to Specific Comments 1 and 3 above.

General Comment 3-Page 16-Well Construction

Comment noted. See response to Specific Comments 1 and 3 above.

Specific Comment 1-Page 17-Well Screen Intervals

The extraction well construction criteria will be to set the well screen from one (1) foot above the water table to approximately ten (10) feet below grade. Construction will be adjusted in the field as necessary to accommodate subsurface conditions including the groundwater table and caliche. M&E will construct all Polygon 84 extraction wells to be screened across and above the caliche layer for treatment. Also see response to Specific Comment 2, Table 3-1 above.

Specific Comment 2-Page 18-Grout

Comment noted. Text has been modified accordingly to reflect ACI Class G Portland Cement.

Specific Comment 3-Page 23-Pipe Schedule

Comment noted. Drawings 84-M-4 and 84-M-9 have been modified accordingly to reflect the correct pipe schedule.

Specific Comment 4-Page 23-Drawing Reference

Comment noted. Drawing reference has been updated.

Specific Comment 5-Page 25-Soil Residuals Reference

The reference for the construction-derived soil residuals management is two memos from ICF Technologies Incorporated dated May 18, 1991 and July 29, 1991. U.S. EPA has these memos on file. A copy of them has also been included. The protocol for these residuals to stage the soil residuals in the approved secure site area. A composite sample will be collected following field activities that may also require sampling. If the concentrations exceed the threshold level, they will remain on site and be re-scheduled for sampling. If the concentrations are below the threshold, the soils will be spread in the U.S. EPA-approved area.

Specific Comment 6-Page 26-Schedule

Comment noted. In accordance with the Consent Decree (VII,D.13), Goodyear shall start the system within 180 days of U.S. EPA design approval. Polygon 84 start-up has been accelerated in accordance with a polygon treatment re-prioritization. The schedule has been modified accordingly. Also see response to Letter Comment 1 above.

Specific Comment 7-Drawing 84-M-5

Comment noted. Drawing was used for Polygon 79. It has no utility in Polygon 84 and has been removed.

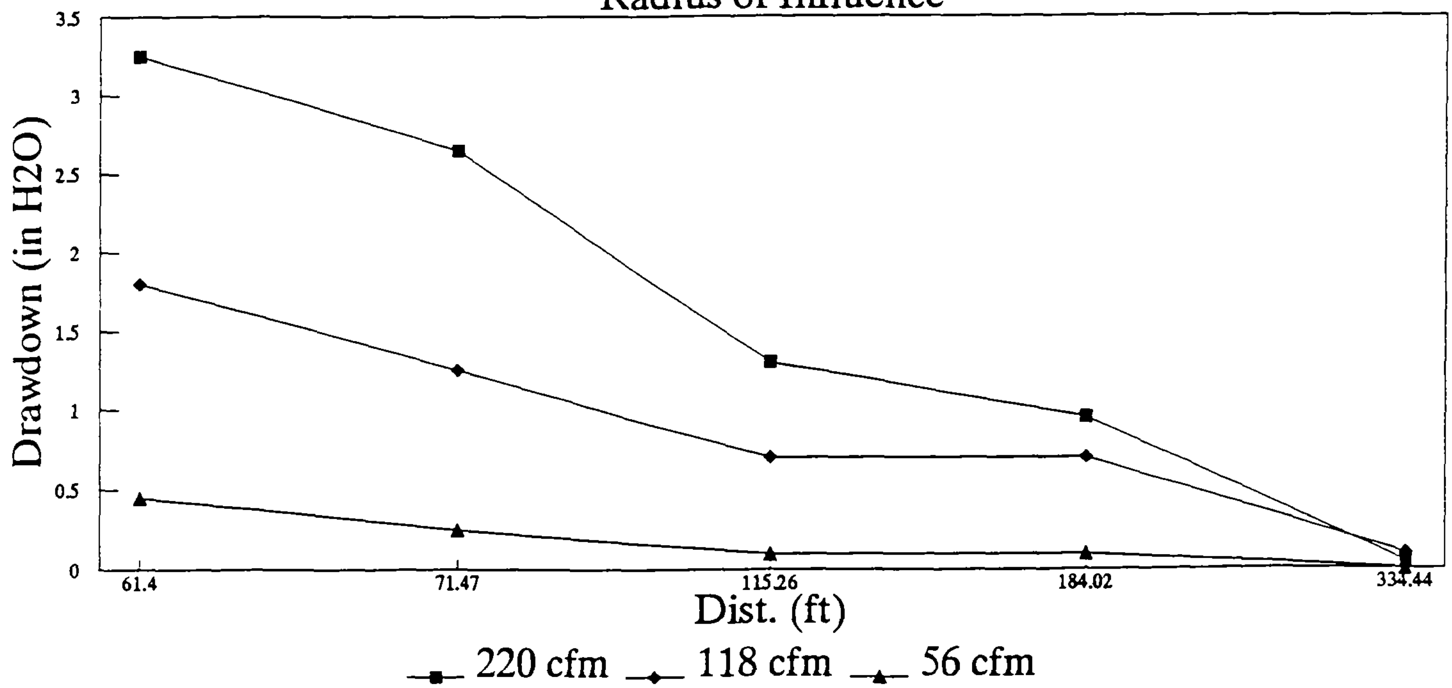
Specific Comment 7-Drawing 84-M-7 Reference

Comment noted. Detail 31 reference has been corrected.

Phoenix-Goodyear Airport Polygon 79 SVE Operations Extraction Well VEW-79-4 On October, 1993 (SPZ-10/15/93-VAC1.WK3)				
Flow cfm		220	118	56
Distance from	Distance (ft)	Vacuum (50) (in H2O)		
VP-79	61.4	3.25	1.8	0.45
VP-79-4	71.47	2.65	1.25	0.25
VP-79-3	115.26	1.3	0.7	0.1
VP-79-1	184.02	0.95	0.7	0.1
VP-79-2	334.44	0.05	0.1	0

PGA-SVE Polygon 79 Start Up

Radius of Influence



M&E Metcalf & Eddy
An Air & Water Technologies Company

March 25, 1994

Mr. Craig Cooper
U.S. EPA H-7-2
75 Hawthorne Street
San Francisco, California 94105

Subject: SVE Draft Final Design-Polygon 84
Phoenix-Goodyear Airport Site
Goodyear, Arizona

Dear Mr. Cooper:

Enclosed, please find the Draft Soil Vapor Extraction (SVE) Final Design for Polygon 84. This report is submitted on behalf of the Goodyear Tire and Rubber Company in accordance with the Consent Decree (Section VII, Subsection D-15).

Polygon 79 formally entered the final closure rebound period on February 24, 1994 in accordance with Appendix B of the Consent Decree. As a result, the design for the next polygon requiring SVE remedy is due to U.S. EPA on or by March 28, 1994. This document satisfies the requirements of the Consent Decree, Section VII, Subsection D-15 for the design submittal of the next polygon to undergo SVE remedy after Polygon 79.

This design submittal has been prepared for Polygon 84 based on negotiations with U.S. EPA in October of 1993 and transmitted to U.S. EPA on November 1, 1993. Polygon 84 was proposed to be treated after Polygon 79 and prior to Polygons 96, 27A, and 92 since the treatment system would not require relocation. Benefits of this negotiation are that it accelerates the schedule by elimination of moving the treatment system and it facilitates treating Polygons 84 and 79 simultaneously should the soil vapor concentrations rebound over the clean up threshold.

This design document is a modification of the November 25, 1992 SVE Final Design submitted for Polygon 79. Two primary design changes have been made based on operation of the SVE system in Polygon 79. The changes are an increase in the design radius of extraction well influence from 100 to 150 feet and the use of single, fully-penetrating extraction wells rather than dual-completion wells. These changes will not have an impact on the polygon remediation and will ease installation and operation around the CAVCO facility.

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Mr. Craig Cooper
U.S. EPA
March 25, 1994
Page Two

In accordance with Consent Decree item D-12, a draft Operations and Maintenance (O&M) Manual will be submitted to U.S.EPA thirty (30) days prior to start up. The draft O&M manual will consist of an addendum to the existing November 5, 1993 SVE O&M manual and will be specific to Polygon 84 operations and monitoring. A section will also be developed for Polygon 79/84 combined operation should it be needed.

An estimated project schedule has been provided in section six of the document.

If you have any questions regarding this document or any other site issues, do not hesitate to contact myself at (619) 233-7855 or Mr. Mark Whitmore at (216) 796-3863.

Sincerely,

METCALF & EDDY, INC.

Scott P. Zachary
SVE Project Manager

FOR

Lawrence S. Reider, P.E.
Senior Chemical Engineer

Attachments:

SVE Final Operation & Maintenance Manual

cc: M. Whitmore, Goodyear Tire and Rubber Company
L. Smith, URS Consultants
R. Bartholomew, Bartholomew Engineering
J. Kasarskis, Arizona Department of Environmental Quality
T. Struttmann, Sharp and Associates, Inc.
T. Heim, Loral Corporation
L. Reider, Metcalf & Eddy, Inc.

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REPORT

SOIL VAPOR EXTRACTION (SVE) FINAL REMEDY CONSENT DECREE FINAL EXTRACTION AND TREATMENT SYSTEM DESIGN - POLYGON 84

PHOENIX-GOODYEAR AIRPORT (SOUTH) SUPERFUND SITE, GOODYEAR, ARIZONA

Submitted to:

The Goodyear Tire and Rubber Company
1144 East Market Street
Akron, Ohio

March 25, 1994
(Revised May 13, 1994)

Metcalf & Eddy, Inc.
450 B Street, Suite 1900
San Diego, California 92101

SOIL VAPOR EXTRACTION (SVE)
FINAL REMEDY CONSENT DECREE
FINAL EXTRACTION AND TREATMENT
SYSTEM DESIGN - POLYGON 84

PHOENIX-GOODYEAR AIRPORT (SOUTH)
SUPERFUND SITE, GOODYEAR, ARIZONA

Submitted to:

The Goodyear Tire and Rubber Company
1144 East Market Street
Akron, Ohio

March 25, 1994
(Revised May 13, 1994)

M&E

Metcalf & Eddy, Inc.
450 B Street, Suite 1900
San Diego, California 92101

TABLE 3-1
SOIL VAPOR EXTRACTION WELL PARAMETERS

Parameter	Specification
Well Boring Depth	60 feet or capillary fringe (whichever is shallower)
Well Boring Diameter	10 inches (nominal) O.D.; 6-1/4 inch I.D.
Well Drilling Method	Hollow stem
Well Screen	3-inch Dia., Sch 40 PVC, flush thread, 0.02-inch Machine Slot
Well Screen Depth	10 to 60 feet b.g.s.
Screen Gravel Pack	Colorado 8-12 silica or 3/8-inch washed round pea stone
Bottom Hole Seal	8-20 Wyoming bentonite crumbles, (8-12 sieve) 6 inches min.
Well Sand Seal	Colorado #30 sand, 1.0 foot (or equivalent)
Well Annular Seal	Wyoming 8-20 bentonite crumbles, min. 1.5 feet placed and hydrated in 6-inch lifts.
Annular Seal to Road Box	Portland neat cement with 10% powder volclay.
Road Box	36-inch by 36-inch steel vault w/hinge lid, H-20 rating.
Road Box Completion	Concrete aggregate, 3,000 psi commercial, no additives, slope apron to grade.
Well Head Connections	3-inch Dia, Sch. 40/80 PVC fittings, true-union Ball valves, socket connection
Well Instrumentation	2-3/8 inch, 2-1/4 inch, 1-3/4 inch compression fittings for flow, pressure, concentration measurement

adjusted accordingly to ensure that the entire screened interval is in the vadose zone and does not intersect the water table.

Prior to well construction, the bottom of the borehole will be checked for groundwater and sealed to prevent a direct conduit for ground water/capillary water to migrate to the extraction well. The borehole bottom will be sealed with a 6-inch lift of Wyoming 8-20 sieve bentonite crumbles. The bentonite will be hydrated in place via a 3/4 inch tremie pipe by 1.0 gallon of de-ionized water. Once the seal is fully hydrated as confirmed by a weighted measuring tape, the lower extraction well will be constructed.

The extraction well screen will extend from 10 to approximately 60 feet below ground surface (bgs). Should the capillary fringe water table be encountered at a depth of less than 60 feet, the well screen will be shortened so that it does not extend into the capillary fringe. As specified in Table 3-1, 3-inch diameter, Schedule 40 PVC well materials will be used. All joints will be flush threaded and the screen will be machine slotted with 0.02 inch openings. The remainder of the well to grade will consist of Schedule 40 PVC casing.

The well gravel pack will consist of Colorado 8-12 sieve silica sand or 3/8 inch washed round pea stone to 1 foot above the screen top. While the gravel pack is in place, the drilling casing will be pulled to ensure a competent gravel pack and minimize vadose zone cave in. A 1-foot sand seal of Colorado No. 30 silica sand will be placed on top of the 8-12 silica to prevent the bentonite seal from being drawn into the 8-12 silica under extraction operations. If 3/8 inch washed pea stone is used, the sand seal will not be used, and two additional 6-inch lifts of Wyoming 8-20 bentonite crumbles will be installed, each hydrated with deionized water using a 3/4 inch tremie pipe. The well screen top will be adjusted to accomodate treatment above the caliche layer.

A bentonite seal will then be placed in the boring to seal the extraction well. The bentonite seal will consist of a minimum 1.5 feet of Wyoming 8-20 sieve bentonite crumbles placed and hydrated in 6-inch lifts. Each lift will be checked for proper moisture content with a tape. Water addition will be adjusted in the field as necessary. Once the bentonite seal has been placed, the remainder of the boring will be sealed with an ACI Class G Portland cement grout with a 10 to 15% powdered bentonite amendment. Following grout placement, the ground around the extraction well will be prepared for well head completion. Well completions use a vaulted underground method as illustrated on Drawing 84-M-5, Detail 6 in Appendix A.

Roadway or floor vault completion will consist of excavating around the SVE well to a depth of approximately 2 feet 9 inches. Drawing 84-M-5, Detail 3 illustrates the construction configuration of the well vault. Once the excavation is complete, the base of the excavation will be compacted to 95%. After the base has been compacted, the well vault will be set. The cover of the vault should be approximately 1 inch above grade for surface water drainage. Following well vault placement, the final concrete apron should be poured and worked to slope away from the vault outer lip for surface water drainage diversion. A 3,000 psi commercial mix, no-additive concrete should be used. Prior to backfilling and concrete installation, the 4-inch diameter well header should be terminated and capped inside the well vault.

Connection of the extraction wells to the 4-inch lateral will be accomplished through the use of 3-inch diameter Schedule 40 or 80 PVC fittings. Drawing 84-M-5, Detail 6 illustrates the connection of the SVE wells to the well header. A valve has been installed in the bottom of the 4-inch lateral for condensate drainage for vaulted installations. Lateral piping is sloped at approximately 1% (0.01 feet per foot) toward the extraction wells so that any collected water from condensation inside the piping during periods of shut-down will automatically drain back to the extraction well. The November 5, 1993 Final SVE Operation and Maintenance Manual for Polygon 79 contains detailed information on the operation and maintenance of the SVE wells.

3.2 SOIL VAPOR MONITORING WELLS

Each soil vapor extraction well requires a paired monitoring well for vacuum drawdown adjustment as well as remedial monitoring compliance for closure.

Each monitoring well will be constructed as a cluster of four sample tubes, screened at four different depths to monitor vapor pressure and concentrations at varying strata. See Drawing 84-M-1, Detail 7 in Appendix A.

A single soil boring will be drilled from ground surface to just above the present elevation of the groundwater table in each of the three Polygon 84 sub-areas using a hollow-stem auger drilling rig. during drilling, soil core sampling at 5-foot intervals will be performed for lithologic horizontally to the north along the building face, suspended from roof rafters via pipe hangers. See Drawing 84-M-7, Section A-A'. Schedule 80 PVC piping will be used for all vertical and subsurface pipe runs. Schedule 40 PVC piping will be used for all aboveground horizontal runs. See Drawing 84-M-4, Detail 14 for pipe hanger supports and spacing. At the north corner of Building No. 1, the header pipe travels vertically down the west exterior wall to the ground surface. Refer to Drawing 84-M-7, Section A-A' for the schematic layout of piping along Building No. 1. Due to the length of piping along Building 1, an expansion loop will be required to accommodate thermal pipe expansion and contraction. See Drawing 84-M-7, Detail 31, Section A-A'.

The 6-inch pipe will then be installed below grade, the invert of the 6-inch diameter to be buried a minimum of 30 inches below grade. An underground clean out "T" will be installed in the subsurface header to remove excessive water and sediment if needed. See Drawing 84-M-6, Detail 27. A 6-inch by 4-inch reducer will be installed after the 90° elbow at the invert and the 4-inch diameter Schedule 80 header will travel north below ground to a traffic vault located at the southwest corner of Building No. 6. Refer to Drawing 84-M-6, Details 27, and 25 for underground roadway and vault details. See Drawing 84-M-3, Detail 9 for a typical trench section.

Inside the traffic vault, a 4-inch Schedule 80 PVC lateral, which serves vapor extraction well VEW-84-2, connects to the header pipe. This lateral travels west below grade and connects with VEW-84-2 in a traffic vault below grade. See Drawing 84-M-6, Detail 29 for a typical trench section; Drawing 84-M-5, Details 6 and 3 for extraction well and vault details and 84-C-1 for the well and piping location.

From the traffic vault, the header surfaces and continues north along Building No. 6 to connect with laterals to VEW-84-1 and VEW-84-2. The SVE piping layout for Building No. 6 is shown on Sections B-B' and C-C' of Drawing 84-M-8. See Drawing 84-M-7, Detail 32 for detail of the subsurface header riser at Building No. 6. After surfacing, the 4-inch Schedule 80 header travels up the exterior building wall, is piped through the wall, and continues up along the south interior wall to the building rafters, secured via pipe supports (see Drawing 84-M-4, Detail 15). The wall pass through is shown on Drawing 84-M-6, Detail 26.

The header continues north, suspended from the building rafters and terminates at the junction of two laterals which serve VEW-84-1 and VEW-84-3. The laterals are connected to the header via a tee connection. The lateral to VEW-84-3 continues north along the building rafters, passes through the north exterior wall, and turns and follows the north exterior wall to the ground surface. See Drawing 84-M-4, Details 14 and 15 for pipe hanger and wall support details and Drawing 84-M-8, Section C-C'. A 4-inch by 3-inch reducer is installed in the lateral and the 3-inch lateral connects with VEW-84-3 in a traffic vault below grade. See Drawing 84-M-9, Detail 40, and Drawing 84-M-5, Detail 6.

At the lateral/header tee connection, the 4-inch PVC lateral to VEW-84-1 branches east inside Building No. 6 and follows a wood ceiling support beam to concrete roof support E-2. See Section B-B', Drawing 84-M-8. At E-2, the lateral travels vertically down the column to floor grade, secured by pipe supports (see Drawing 84-M-4, Detail 15). A 4-inch by 3-inch reducer is

SECTION SIX

SCHEDULE

Upon acceptance of the Polygon 84 Soil Vapor Extraction System Final Design by U.S. EPA, Goodyear will proceed directly with carrying out the stated tasks.

All tasks will be carried out in accordance with the 1990 Consent Decree and its associated appendices as outlined in this document. The main tasks that will be carried out under this SVE Operable Unit Final Design include:

1. Prepare for Polygon 84 bid packages for materials, drilling, and construction services for the SVE Operable Unit.

2. Install Polygon 84 extraction and monitoring wells.

3. Install Polygon 84 piping conveyance system.

4. Test SVE Operable Unit wells in Polygon 84 and SVE treatment system.

5. Initiate operation of the SVE system in Polygon 84 with Polygon 79 if required.

Each of these major schedule items is listed in Figure 6-1 and are broken into week-long segments. M&E will conduct all work in a timely manner in order to complete all of the listed tasks in Figure 6-1 and implement the SVE Final Remedy within 180 days. The 180 day deadline is in accordance with schedule item D-12 of U.S. EPA Consent Decree. Within 60 days after U.S. EPA approval, M&E will commence site construction activities which will include the installation of the soil vapor extraction and monitoring wells as required (Schedule item D-13). Figure 6-1 illustrates the anticipated Polygon 84 Schedule which reflects an acceleration of all field activities.

It should be noted that both the bidding/procurement process for the SVE Operable Unit components and construction contractors will be carried out to ensure that Polygon 84 is ready for start-up within the 180-day deadline. Figure 6-2 shows a flow chart of activities that will be conducted at the site in accordance with the project schedule. Every effort will be made to accelerate this schedule since the operable unit treatment system is not being installed in Polygon 84. Start up of Polygon 84 will commence upon completion of well/piping installation and approval of the Polygon 84 Draft O&M Manual, due to U.S. EPA 30 days prior to start up (see Figure 6-1). Polygon 84 operations will commence regardless of the outcome of the May 25,

14. Struttmann, T.J. and S.P. Zachary, 1993, Design of Soil Vapor Extraction systems Using Groundwater Flow Models. Proceedings of the Groundwater Modeling Conference, Golden, Colorado, June 9-11, 1993. International Groundwater Modeling Center at the Colorado School of Mines. Section 6, pp. 11-20.

15. Sharp and Associates, Inc., October 29, 1993, letter to U.S. EPA; Phoenix-Goodyear Airport; Soil Vapor Extraction Rebound initiation/verification definition.

16. Metcalf & Eddy, Inc., November 25, 1993, Soil Vapor Extraction (SVE) Final Remedy Consent Decree Final Extraction and Treatment System Design, Phoenix-Goodyear Airport (South) Superfund Site, Goodyear, Arizona.

17. Metcalf & Eddy, Inc., March 30, 1992, Soil Vapor Extraction (SVE) Final Remedy Consent Decree Design Memorandum and Work Plan, Phoenix-Goodyear Airport (South), Goodyear, Arizona.

18. ICF Technology Incorporated, May 18, 1991, Correspondence to Bartholomew Engineering and U.S. EPA regarding management of construction derived waste.

19. ICF Technology Incorporated, July 29, 1991, Correspondence to Bartholomew Engineering and U.S. EPA regarding management of construction derived waste.

3.0 OVERSIGHT NOTIFICATION

Due to the type of system and fail-safe nature of operation, notification of federal, state, and local agencies is not anticipated. If a system emergency should require oversight notification, the following agencies will be notified within 24 hours of the emergency for response.

3.1 Local Site Representative

Loral Corporation
3200 S. Litchfield Road
Goodyear, Arizona 85338
Mr. Tom Heim/Mr. Randy Clark
(602) 925-7102/-7274

3.2 State Site Representative

Arizona Department of Environmental Quality
3033 N. Central Avenue, 7th Floor
Phoenix, Arizona 85012
Mr. Jim Kasarskis
(602) 207-4218

3.3 Federal Site Representative

United States Environmental Protection Agency
Superfund Enforcement Branch (H-7-2)
75 Hawthorne Street
San Francisco, California 94105-3901
Mr. Craig Cooper
(415) 744-2370

3.4 Emergency Squad

City of Goodyear Fire Department
S. Litchfield Road
Goodyear, Arizona 85338
(602) 932-3050

American Ambulance
1401 E. Washington St.
Phoenix, Arizona
(602) 253-1492

Lifeflite Air Ambulance
(602) 985-2873

Phoenix - Goodyear Airport Superfund Site

Soil Vapor Extraction Operable Unit Final Design - Polygon 84/79

Goodyear, Arizona

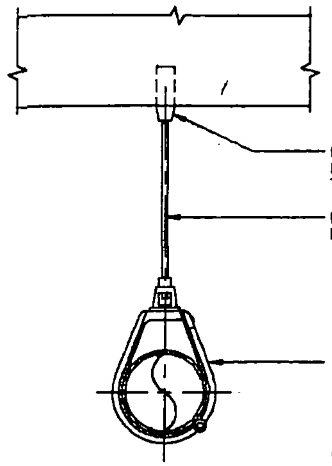
For:
Goodyear Tire and Rubber Company
Akron, Ohio

Draft: March 25, 1994 (Polygon 84)
Final: May 13, 1994 (Polygon 84)

LIST OF DRAWINGS

DRAWING NO.	DRAWING TITLE
	COVER SHEET
84-P-1	SITE MAP
84-C-1	POLYGON 79/84 LAYOUT
84-M-1	TREATMENT SYSTEM LAYOUT, PIPING AND WELL DETAILS
84-M-2	EXTRACTION WELLS AND PIPING DETAILS I
84-M-3	EXTRACTION WELLS AND PIPING DETAILS II
84-M-4	EXTRACTION WELLS AND PIPING DETAILS III
84-M-5	EXTRACTION WELLS AND PIPING DETAILS IV
84-M-6	EXTRACTION WELLS AND PIPING DETAILS V
84-M-7	EXTRACTION WELLS AND PIPING DETAILS VI
84-M-8	EXTRACTION WELLS AND PIPING DETAILS VII
84-M-9	EXTRACTION WELLS AND PIPING DETAILS VIII
84-E-1	ELECTRICAL AND INSTRUMENTATION SYMBOLS
84-E-2	PROCESS & INSTRUMENTATION DIAGRAM 1
84-E-3	PROCESS & INSTRUMENTATION DIAGRAM 2
84-E-4	ELECTRICAL ONE LINE AND INTERCONNECTION DIAGRAM
84-E-5	ELECTRICAL CONTROL WIRING DIAGRAM
84-E-6	ELECTRICAL CONTROL PANELS

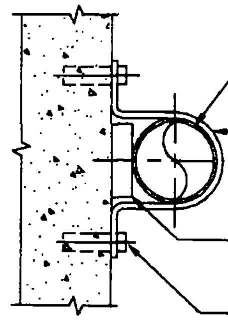
Metcalf & Eddy



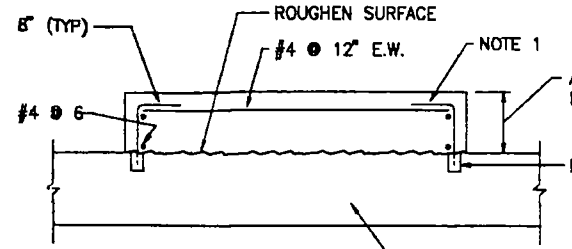
NOTE:

SUPPORT SPAN 6" DIA SCH 80 PVC = 12 FT
6" DIA SCH 40 PVC = 9 FT
4" DIA SCH 80 PVC = 10 FT
4" DIA SCH 40 PVC = 7 FT

PIPE HANGER (14)
SCALE: NONE



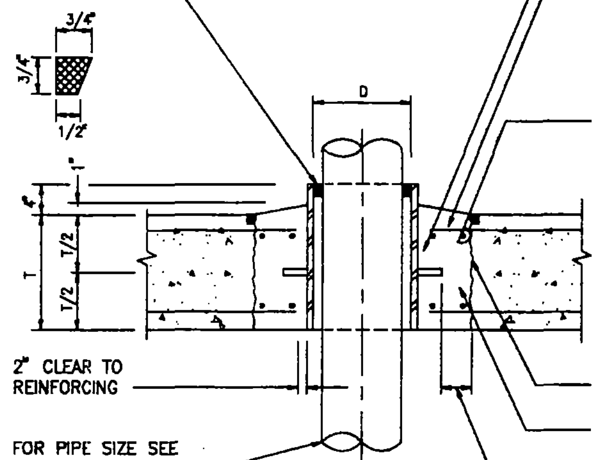
PIPE SUPPORT (15)
SCALE: NONE



NOTES:

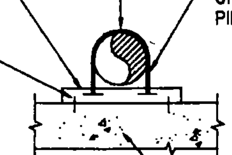
1. 1/2" ø ROD THREADED ONE END AT 12 INCHES O.C. MIN OR AS SIZED ON THE STRUCTURAL SHHETS.
2. AT EACH VERTICAL ROD PROVIDE STAR SLUGIN (2-UNIT THREADED SET FOR 1/2"ø ROD OR 3-UNIT THREADED SET FOR 5/8"ø ROD AND LARGER) COMPOUNDED ANCHOR OR AN ACCEPTABLE EQUIVALENT ACHOR.
3. EQUIPMENT ANCHORS TO BE SET WITH MIN 3" EMB PATTERN BY MFG.

CONCRETE PEDESTAL (16)
SCALE:NONE



1. THE USE OF HEAVEY-DUTY PNEUMATIC HAMMERS ARE NOT PERMITTED TO REMOVE EXISTING CONCRETE FOR NEW PIPE OPENING.
2. APPLY BONDING AGENT TO ROUGHENED PREPARED CONCRETE SURFACE IN ACCORDANCE WITH MANUFACTURER'S PRINTED INSTRUCTIONS. BONDING AGENT TO BE. LARSEN WELD-CRETE AS MANUFACTURED BY LARSON PRODUCTS CORPORATION OF ROCHVILLE, MARYLAND OR AN ACCEPTABLE EQUIVALENT PRODUCT.
3. AFTER PIPE SLEEVE IS SET, FILL PENETRATION WITH CONCRETE HAVING A MINIMUM COMPRESSIVE STRENGTH OF 4000 LBS. PER SQ INCH AT THE END OF 28 DAYS
4. FOR FLOOR SLEEVES WHERE GASTIGHT OR WATERTIGHT SEALS ARE NOT REQUIRED, THE SEAL MAY BE OMITTED, WHERE IT IS REQUIRED SEE MANUFACTURER'S RECOMMENDATIONS FOR DIAMETER OF PIPE SLEEVE. FOR FLUSH MOUNT APPLICATIONS, USE ROADWAY VAULT 8" DIA. DIVERSIFIED WELL PRODUCTS OR EQUIVALENT.
5. WHEN SEAL IS OMITTED, PACK AND SEAL WITH JOINT COMPOUND SEE NOTE 4.

WALL SLEEVE (17)
SCALE: NONE



NOTE:

1. DIMENSIONS AND UNISTRUT PART NUMBERS TYPICAL FOR ALL SUPPORTS UNLESS OTHERWISE INDICATED
2. SUPPORT SPAN 6" DIA SCH 80 PVC = 12 FT
6" DIA SCH 40 PVC = 9 FT
4" DIA SCH 80 PVC = 10 FT
4" DIA SCH 40 PVC = 7 FT

PIPE ANCHOR DETAIL (19)
SCALE: NONE

NUMBER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION
1	2-94	SZ		POLYGON 84 DESIGN
2	5/13/94	KW	SZ	EPA COMMENTS INCORPORATED

M&E METCALF & EDDY

DESIGNED ______
DRAWN ______
CHECKED ______

SCALE: NONE

M&E SAN DIEGO, CA 1994 DATE
CALIF. R.E. No. ______

PGA – Goodyear

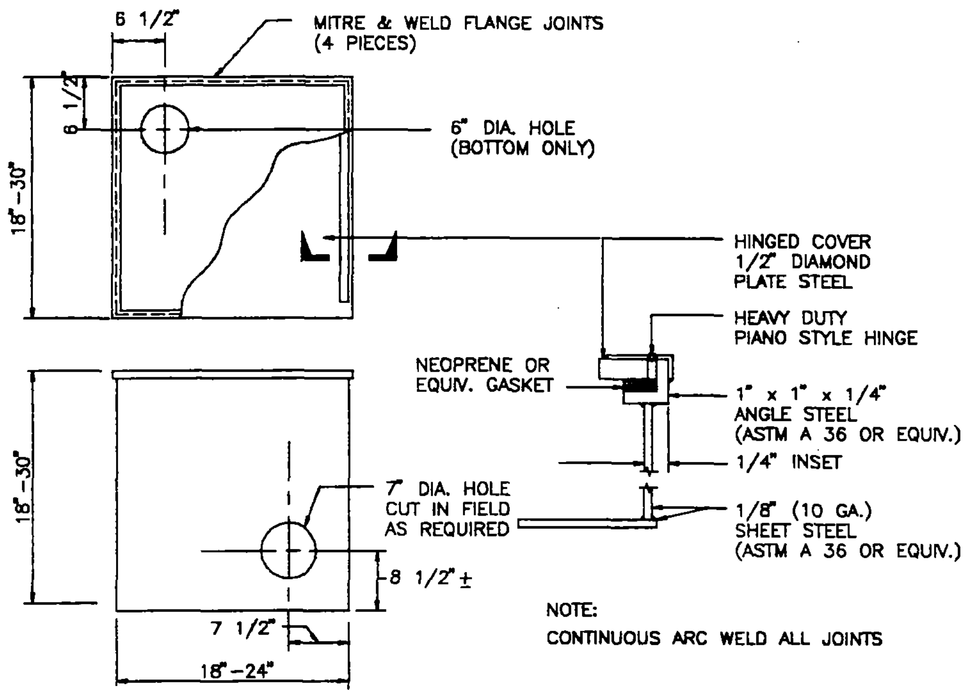
APPROVED ______ DATE

SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN – POLYGON 84/79

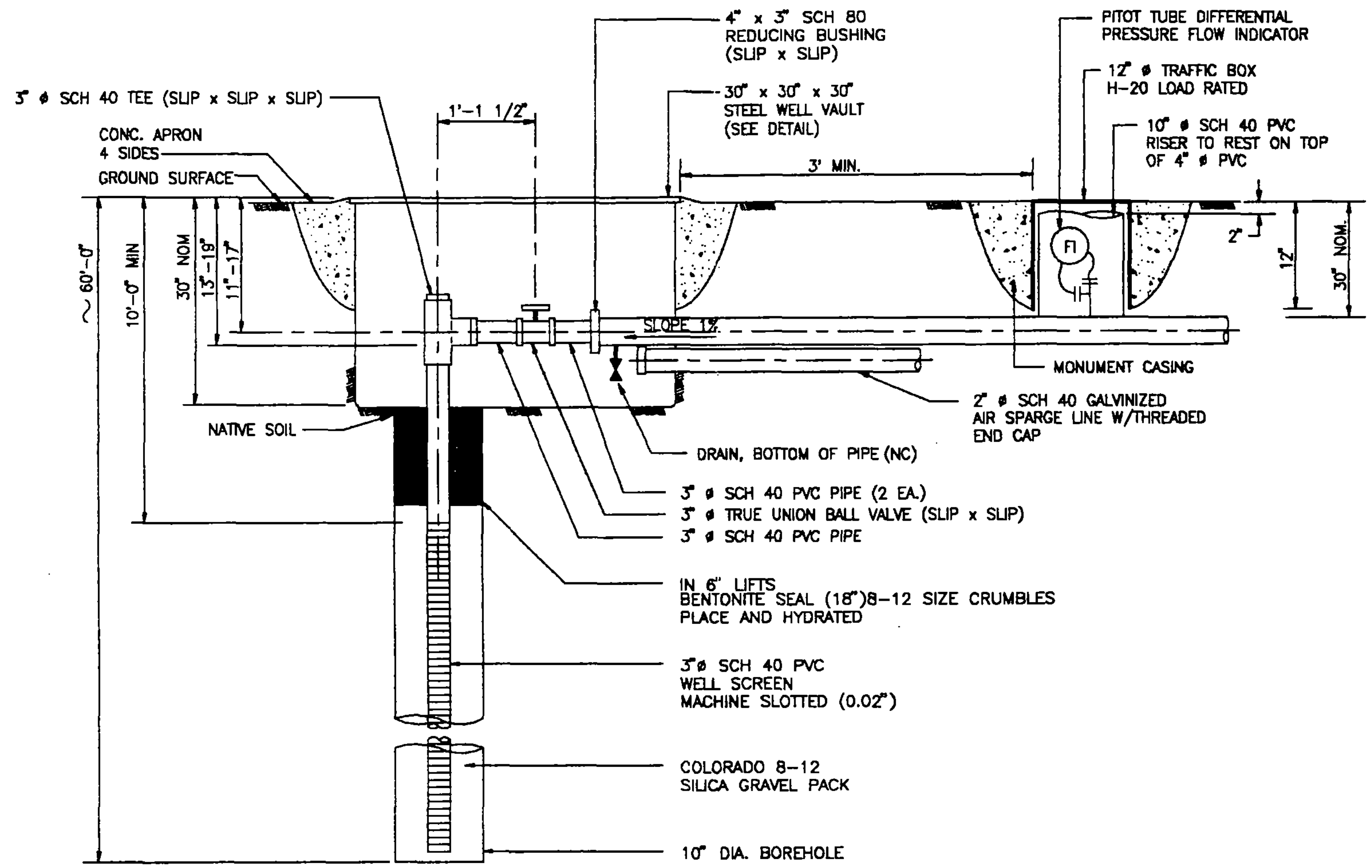
EXTRACTION WELLS AND PIPING DETAILS III

DRAWING NO: 84-M-4
SHEET: 7
OF 18 SHEETS

YT84M-4



STEEL ROADWAY VAULT DETAIL (3)
SCALE:NONE



EXTRACTION WELL DETAIL VEW-84-2 (6)
SCALE:NONE

NUMBER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION
1	10-93	SPZ		FIELD AS-BUILT
2	2-94	SPZ		POLYGON 84 DESIGN
3	5/13/94	KW	SPZ	EPA COMMENTS INCORPORATED

M&E METCALF & EDDY

DESIGNED L.R.
DRAWN
CHECKED
SCALE: NONE
M&E SAN DIEGO 1994 DATE
CALIF. R.E. No.

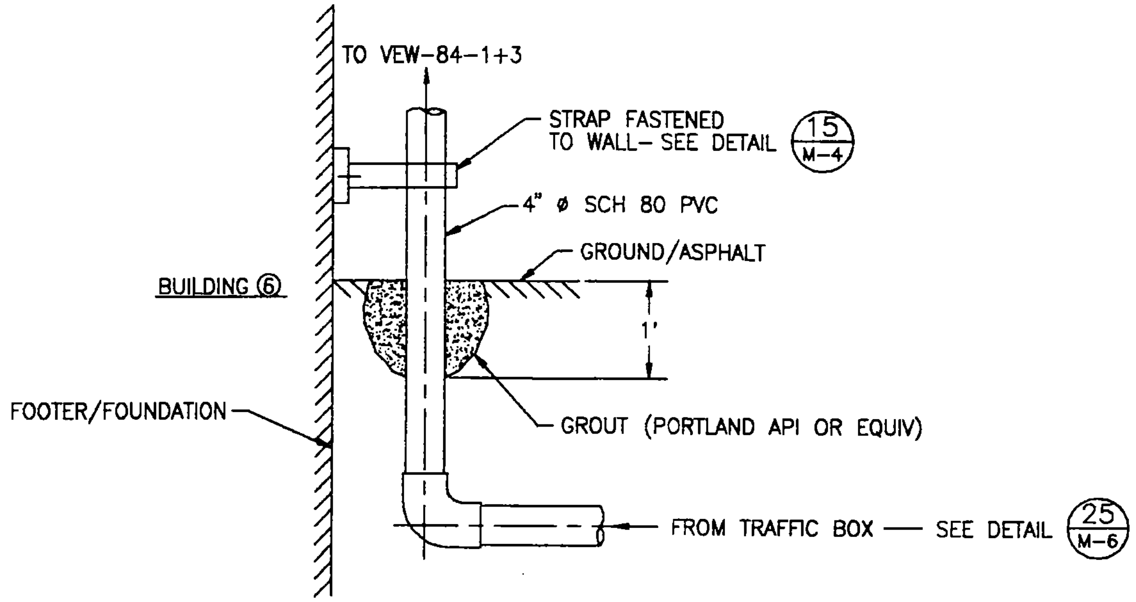
PGA – Goodyear

APPROVED DATE

SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN – POLYGON 84/79
EXTRACTION WELLS AND PIPING DETAILS IV

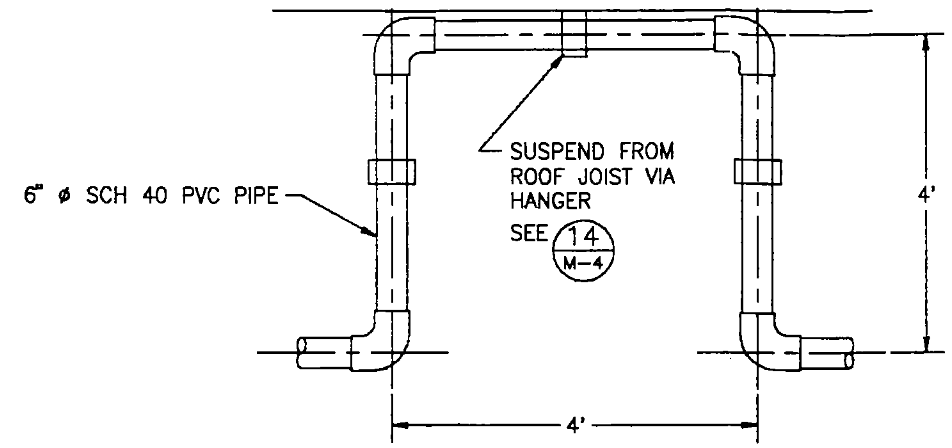
DRAWING NO: 84-M-5
SHEET: 8
OF 18 SHEETS

YT84M-5



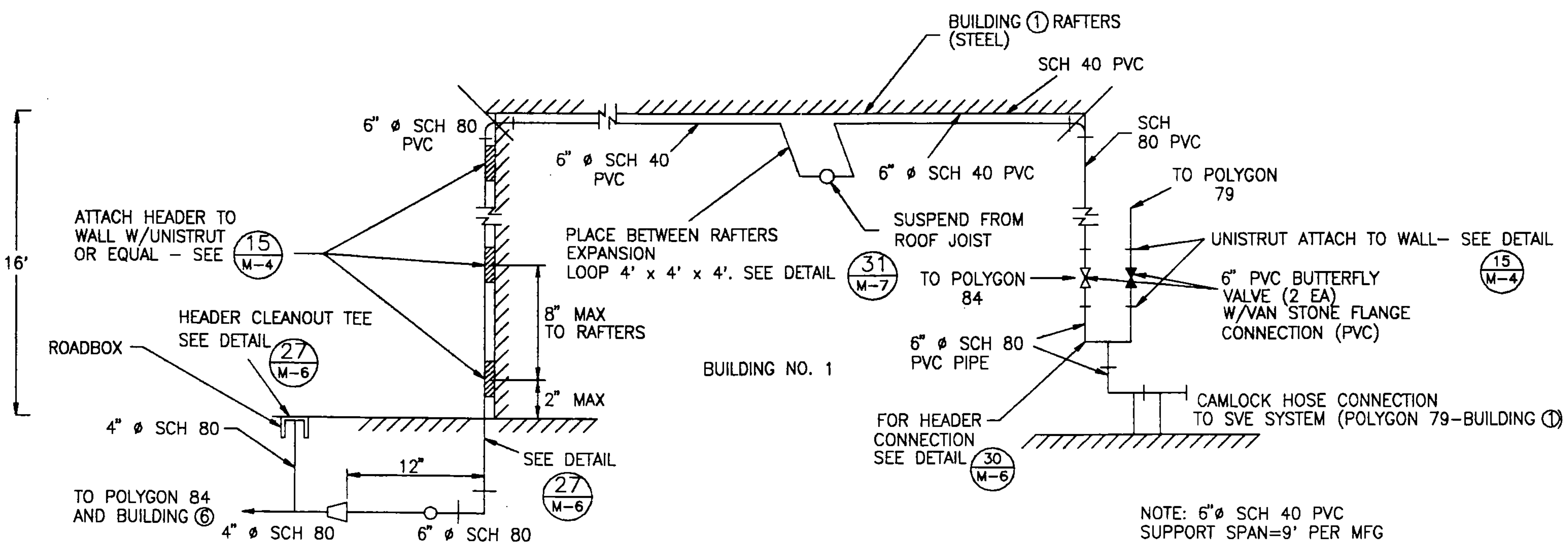
BUILDING ⑥ SUBSURFACE HEADER RISER

DETAIL 32
SCALE:NONE



MAIN HEADER EXPANSION LOOP
ALSO SEE SECTION A-A' THIS SHEET

DETAIL 31
SCALE:NONE



NOTE: 6"ø SCH 40 PVC
SUPPORT SPAN=9' PER MFG

SETION A-A'
PIPING SCHEMATIC
SCALE:NONE

NUMBER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION
1	5/13/94	KW	SZ	EPA COMMENTS INCORPORATED

M&E METCALF & EDDY

DESIGNED L.R.
DRAWN
CHECKED

SCALE: NONE

M&E SAN DIEGO 1994 DATE
CALIF. R.E. No.

PGA – Goodyear

APPROVED DATE

SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN – POLYGON 84/79
EXTRACTION WELLS AND PIPING DETAILS VI

DRAWING NO: 84-M-7
SHEET: 10 of 18 SHEETS

GYT84M-7

PARTIALLY SCANNED
OVERSIZE ITEM(S)

See document # 2261488
(1 of 23) to (5 of 23)
for partially scanned image(s).

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EXECUTIVE SUMMARY

Goodyear Tire and Rubber Company (Goodyear) contracted Metcalf & Eddy, Inc. (M&E) to prepare this SVE Operable Unit Draft Design for the remediation of vadose zone soils at the Phoenix-Goodyear Airport facility (PGA). The report is referred to as the SVE Final Design document and provides the draft design for the SVE operable unit for Polygon 84 in accordance with the 1990 Consent Decree (Section VII, Subsection D-15).

Polygon 84 is the second of five polygons present at the PGA facility that require vadose zone remedy using soil vapor extraction (SVE) technology. The first polygon requiring treatment was Polygon 79, approximately 300 feet south of Polygon 84. The SVE system for Polygon 79 was installed during the summer of 1993 and was operated from September 1993 through January 1994. Polygon 79 formally entered the closure rebound monitoring phase on February 24, 1994 as a result of low soil vapor concentrations. Commencement of the closure rebound phase for Polygon 79 initiated Consent Decree deliverable D-15, the design for the next polygon requiring treatment (Section VII).

Prioritization of polygons for remediation is based on the mass of TCE in the polygon vadose zone and its ability to raise the underlying Subunit A groundwater concentration of TCE above 5 ug/l, the site clean up level. Groundwater impact was evaluated using the VLEACH and MixCell models. Using the prioritization, the next polygon formally slated for SVE remedy is Polygon 96.

Polygon 96 is on the opposite side of the Atchinson, Topeka and Santa Fe Railroad spur and would require moving the entire SVE plant. Once Polygon 96 is remediated, the plant would have to be moved back in order to treat the final polygon (84). Due to these logistics, Goodyear negotiated with U.S. EPA to reprioritize the treatment order of the polygons. The reprioritization allows for the treatment of Polygon 84 second after Polygon 79 with the remaining three polygons to be treated as prioritized. For the reprioritization, Goodyear agreed to begin construction and treatment of Polygon 84 prior to receiving the Polygon 79 full closure notice.

The advantage of this treatment order is that it accelerates the overall remediation schedule (Consent Decree, Appendix B) by commencing work on another polygon prior to closure of the preceding polygons and it minimizes the construction time table by eliminating multiple SVE operable unit relocations.

This report has been prepared to satisfy the Consent Decree requirements of Final Design submittal (Section VII, Subsection D-15) for the SVE remedy of Polygon 84. Since Polygon 84 will be treated without relocating the treatment plant currently located in Polygon 79, this Final Design Submittal focuses on the extraction and monitoring well locations as well as its associated piping.

The major sections of this document include:

- Introduction
- In-Place Soil Vapor Extraction Operable Unit
- Soil Vapor Extraction and Monitoring Wells
- Extraction Well Piping
- Residuals Management
- Schedule

Section Two of this report summarizes the major components of the SVE system that are currently in-place in Polygon 79. The general system process is described as well as a description of each of the treatment system components. Basic operational parameters are described as they pertain to the extraction, treatment, and discharge of soil vapor.

Section Three of this report discusses the location, configuration and installation of the Polygon 84 extraction and monitoring wells. The design differs from Polygon 79 in two general ways, the number of treatment wells and the configuration of the wells. A total of three wells are proposed that fully-penetrate the two soil types in the vadose zone.

Section Five discusses the management of the soil residuals that will be generated as a result of drilling and trenching activities.

Lastly, Section Six discusses the Polygon 84 project installation and start up schedule.

The following sections of this Polygon 84 SVE Design outline Goodyear's and M&E's approach to the design of the design of the SVE operable unit for Polygon 84.

SECTION ONE

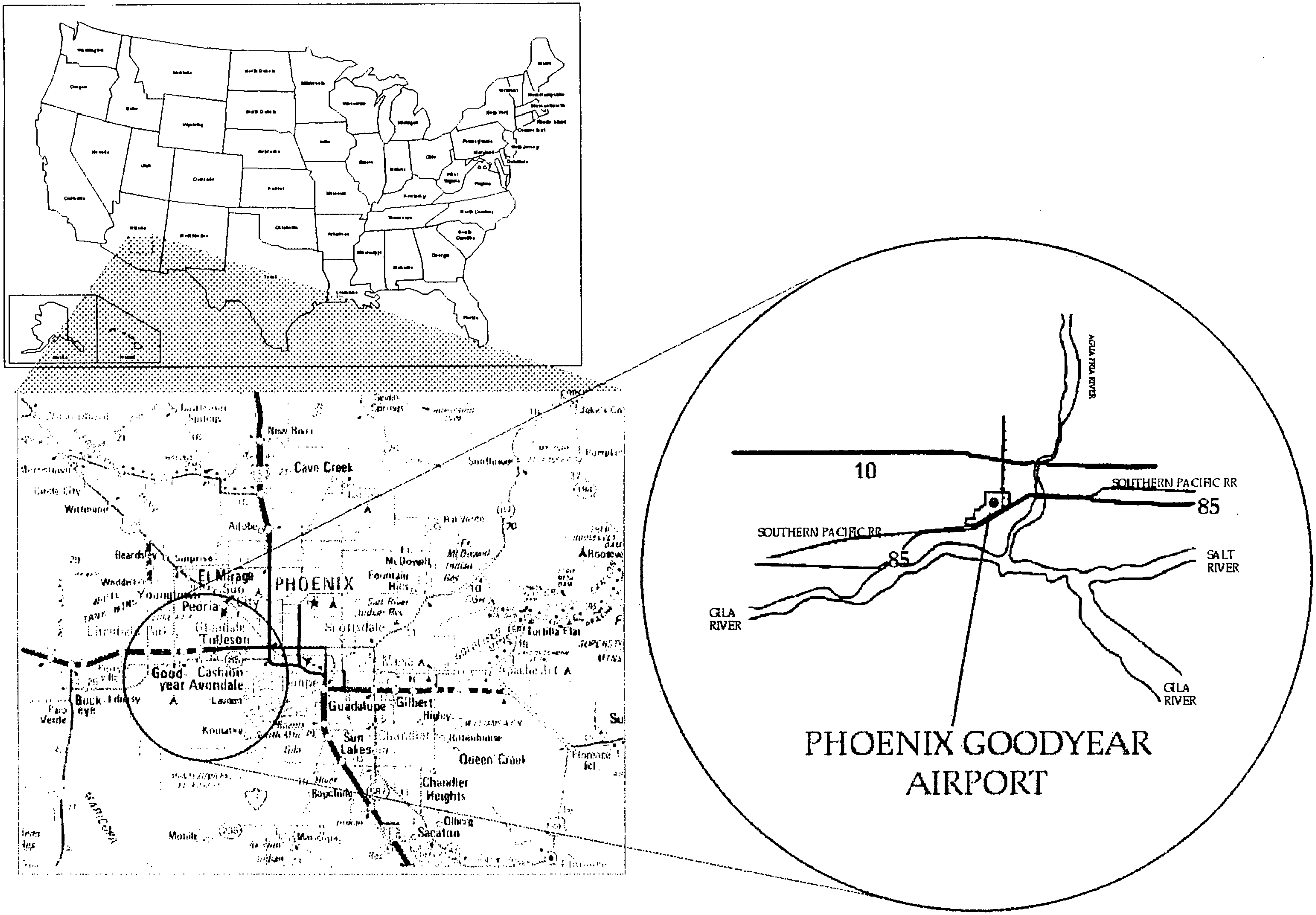
INTRODUCTION

This report is being submitted to the Goodyear Tire and Rubber Company (Goodyear) pursuant to the Civil action Consent Decree and in conformance with the Soil Vapor Extraction (SVE) operable unit remedy for soil remediation. Figure 1-1 illustrates the location of the site and Drawing P-1 (Appendix A) is a detailed map of the site and illustrates the total number of polygons (individual site subdivisions) on the site. The Consent Decree work for soil remediation presented in this document will consist of the design, construction, operation, and maintenance of a soil vapor extraction unit(s) equipped with emission controls to remove VOCs from the vadose zone. Remediation will proceed where VOC residues pose a threat to ground water quality in Subunit A aquifer, as provided in the 1989 Record of Decision (ROD) and satisfies the requirements of Subparagraph C.6 and C.7 of Section VII and Appendix B of the Consent Decree. These areas include polygons of elevated TCE concentrations. Polygons requiring SVE operable unit remedy were determined through three vadose zone investigation and modeling efforts. These investigations were conducted in May 1992, January 1993 and July 1993. Results of the investigations were transmitted to U.S. EPA in the November 25, 1993 Polygon 79 Final Design document and in meetings with U.S. EPA in May and October of 1993.

Data that was collected in 1987 for the site RI/FS and in the three investigations was input into the U.S. EPA-approved VLEACH and MixCell models to evaluate if the vadose zone mass was sufficient to result in TCE concentrations in excess of 5 ug/l in the underlying Subunit A groundwater. Figure 1-2 illustrates the site polygon modeling/screening process.

Table 1-1 presents the results of the polygon screening/modeling and Figure 1-3 illustrates the locations of the five polygons requiring SVE remedy. From the modeling results, the polygons were prioritized based on groundwater impact for SVE remedy. Since Polygon 96 had not been investigated at the time of the first design submittal (September 10, 1992), Polygon 79 was prioritized for SVE remedy. The operable unit was installed during the summer of 1993 and was operated from September 1993 through January 1994.

The final site-wide modeling was completed in October 1993 and the final polygon prioritization as illustrated in Table 1-1 was presented to U.S. EPA on October 19, 1993. Results of the polygon screening/modeling process revealed that a total of five polygons had Subunit A groundwater impacts in excess of the Consent Decree limit of 5 ug/l. These polygons included 96, 79, 92, 27A, and 84, and are prioritized and listed in decreasing order of groundwater impact. Evaluation of the five polygons that require SVE remedy revealed that two polygons (79 and 84) are on the eastern side of the Atchinson, Topeka, and Santa Fe Railroad spur on Loral property. The remaining three polygons (96, 27A, and 92) are on the western side of this railroad spur on City of Phoenix property. Due to these logistics, Goodyear negotiated with U.S. EPA to reprioritize the treatment order of the polygons. The reprioritization allows for the treatment of Polygon 84 second after Polygon 79 with



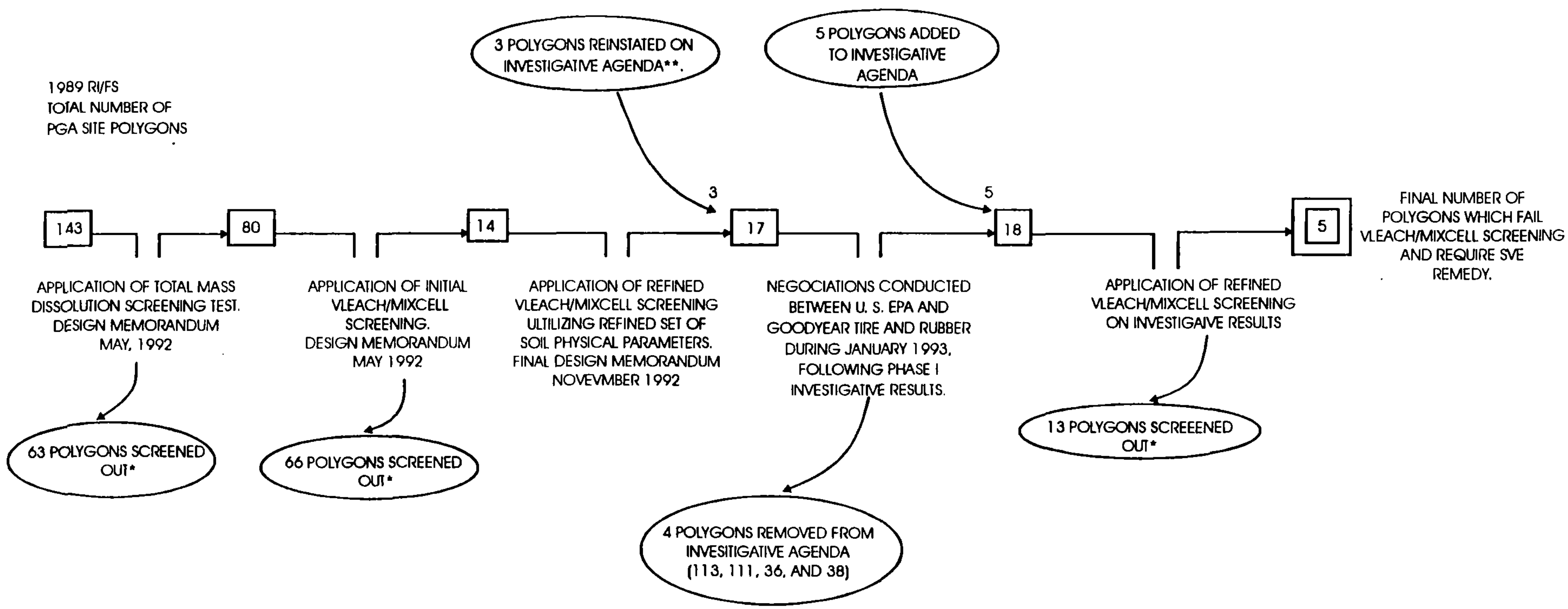
Metcalf & Eddy

PGA Site Location Map
Goodyear Phoenix Airport

Project Number 006791

Figure 1-1

PGA SITE POLYGON INVESTIGATION PROGRESS SUMMARY
1989 RI/FS THROUGH JANUARY 1993 FINAL DESIGN MEMORANDUM



79 : NUMBER OF POLYGONS TO UNDERGO PHASE I/PHASE II INVESTIGATION, VLEACH/MIXCELL RESCREEENING, AND/OR SVE REMEDY (CLASS 2).

65 : NUMBER OF POLYGONS PASSING SCREENING PROCESS WHICH NO LONGER REQUIRE PHASE I/PHASE II INVESTIGATION AND/OR SVE REMEDY (CLASS 1).

3 : NUMBER OF POLYGONS REINSTATED TO PHASE I/PHASE II INVESTIGATIVE AGENDA BASED ON RESCREENING **, OR REGULATORY NEGOCIATIONS.

* : PASSED SCREENING TEST BY CONTRIBUTING TO SUBUNIT A GROUNDWATER TCE CONCENTRATIONS <5 uG/L.

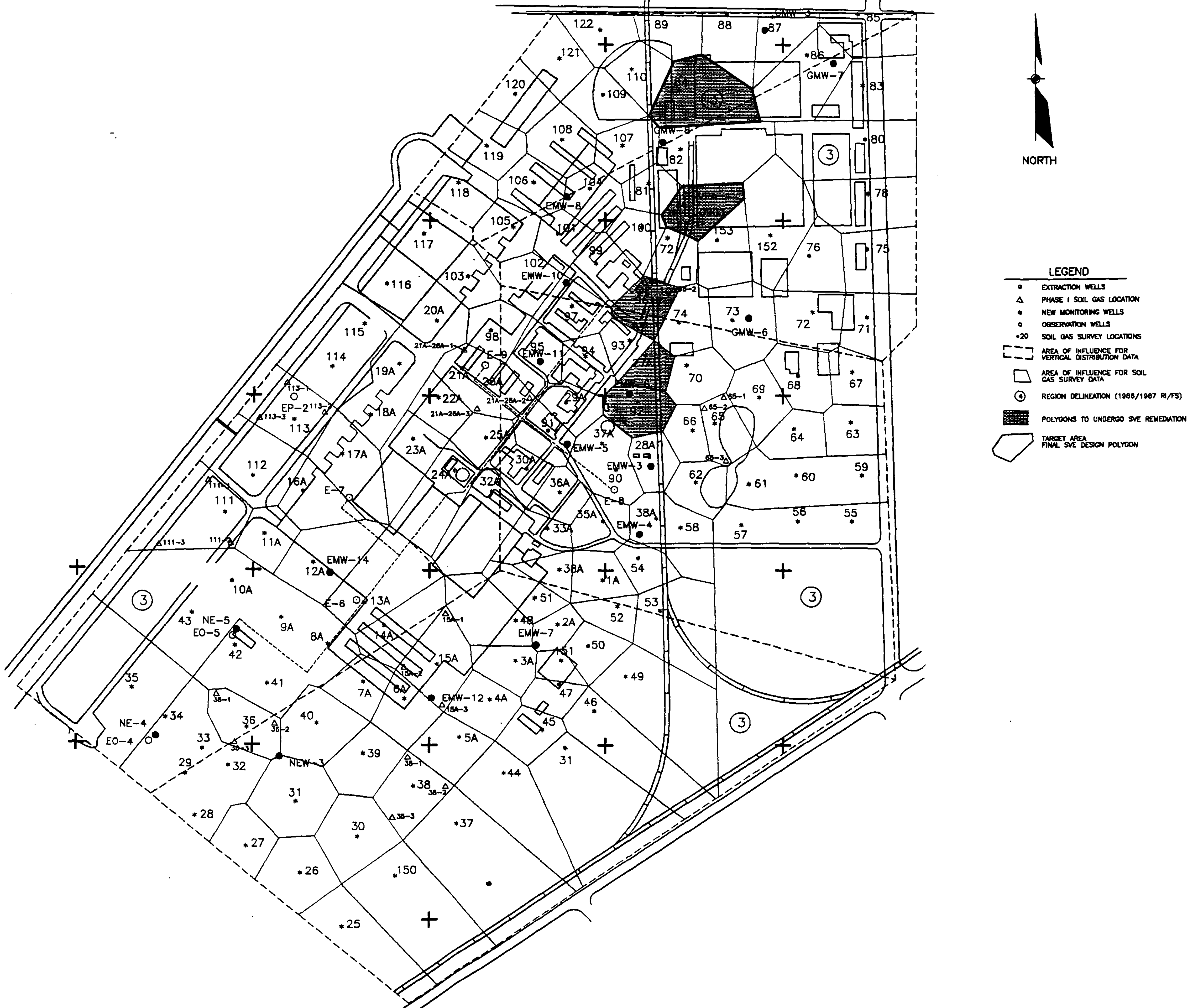
** : FAILED SCREENING TEST (TCE >5 uG/L) FOLLOWING RESCREENING USING REFINED SOIL PHYSICAL PARAMETERS.

Table 1-1
POLYGON PRIORITIZATION
PHOENIX-GOODYEAR AIRPORT
GOODYEAR, ARIZONA

Polygon Designation	Current Max. Groundwater Concentration (ug/L)	Current Polygon Rank	Polygon Status
96	**27.027**	**1**	**R**
79	**8.398**	**2**	**R**
92	**7.571**	**3**	**R**
27A	**5.955**	**4**	**R**
84	**5.685**	**5**	**R**
32A	4.136	6	NFA
23A	3.028	7	NFA
21A, 26A	2.765	8	NFA
93	2.488	9	NFA
65	2.373	10	NFA
13A	2.224	11	NFA
24A	1.843	12	NFA
15A	1.505	13	NFA
14A	0.561	14	NFA
88	0.062	15	NFA
87	0.055	16	NFA

NOTES:

R Polygon to be remediated with SVE system in accordance with Consent Decree.
NFA No further action required for polygon.



...ER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION

M&E METCALF & EDDY

DESIGNED
DRAWN
CHECKED

SCALE: 1" = 600' GRID = 2000'

MAP SAN DIEGO, CA 1994 DATE
CALIF. R.E. No.

PGA - Goodyear

APPROVED DATE

PGA SITE MAP - POLYGON 79

SVE SCREENING INVESTIGATION

FIGURE NO. 1-3

the remaining three polygons to be treated as prioritized. For the reprioritization, Goodyear agreed to begin construction and treatment of Polygon 84 prior to receiving the Polygon 79 full closure notice.

The advantage of this treatment order is that it accelerates the overall remediation schedule (Consent Decree, Appendix B) by commencing work on another polygon prior to closure of the preceding polygons and it minimizes the construction time table by eliminating multiple SVE operable unit relocations.

This report has been prepared to satisfy the Consent Decree requirements of Final Design submittal (Section VII, Subsection D-15) for the SVE remedy of Polygon 84. Since Polygon 84 will be treated without relocating the treatment plant currently located in Polygon 79, this Final Design Submittal focuses on the extraction and monitoring well locations as well as its associated piping.

The major sections of this document include:

- Introduction
- In-Place Soil Vapor Extraction Operable Unit
- Soil Vapor Extraction and Monitoring Wells
- Extraction Well Piping
- Residuals Management
- Schedule

Section Two of this report summarizes the major components of the SVE system that are currently in-place in Polygon 79. The general system process is described as well as a description of each of the treatment system components. Basic operational parameters are described as they pertain to the extraction, treatment, and discharge of soil vapor. Section Two highlights important information detailed in the November 5, 1993 Polygon 79 Final Operations and Maintenance (O&M) Manual. Since treatment operations of Polygon 84 could commence prior to remedy completion in Polygon 79, the November 5, 1993 O&M Manual will be revised in accordance with Section VII, Subsection D-12 of the Consent Decree. The revision will include an operational mode of treating both Polygon 79 and 84 simultaneously if required. This revision will be submitted 30 days prior to Polygon 84 start up for U.S. EPA review and approval. See Section 6, Figure 6-1 for the project schedule.

Section Three of this report discusses the location, configuration and installation of the Polygon 84 extraction and monitoring wells. The number of wells specified for Polygon 79 was based on pilot test data generated in 1987 during the RI/FS. Data generated during the operation of the SVE system in Polygon 79 revealed that the design radius of influence could be extended from 100 to 150 feet. Based on this data, a total of three extraction wells are proposed to treat Polygon 84. Additionally, Polygon 79 operational data revealed that fully-penetrating wells could be installed over the length of the entire vadose zone rather than the more complex dual completion wells in Polygon 79.

Section Four of the report discusses the vapor conveyance system and the connection of the Polygon 84 extraction wells to the SVE treatment system in Polygon 79. The connection will be via PVC pipe that will be installed predominantly aboveground in the rafters of the Loral Buildings No. 1 and No. 6. The piping header and laterals will travel underground in areas where traffic exists.

Section Five discusses the management of the soil residuals that will be generated as a result of drilling and trenching activities.

Lastly, Section Six discusses the Polygon 84 project installation and start up schedule.

In addition to the restrictions and requirements listed in the Consent Decree, this report and all associated appendices are in conformance with the provisions of CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act of 1980 142 U.S.C. Section 9601 et. seg. and the amendment: SARA, Superfund Amendment and Reauthorization Act of 1986 Pub. L. 99-499, 101 Stat. 1613 (1986).

The following sections of this Polygon 84 SVE Design outline Goodyear's and M&E's approach to the design of the design of the SVE operable unit.

SECTION TWO

IN-PLACE SOIL VAPOR EXTRACTION OPERABLE UNIT

As discussed in Section One, the remediation of Polygon 84 has been accelerated due to its proximity to the SVE operable unit which is currently in place in Polygon 79. Polygon 79 is currently in its 90-day permanent closure rebounding period as required by the Consent Decree. Acceleration of Polygon 84 remediation was proposed by Goodyear to eliminate relocating the SVE treatment system.

Goodyear negotiated with U.S. EPA (letter to U.S. EPA dated November 1, 1993 Appendix J) to reprioritize the five polygons for treatment. The polygons were reprioritized to treat Polygon 84 second, following Polygon 79 which allows treatment without SVE system relocation. For this reprioritization, Goodyear agreed to accelerate the clean up and start Polygon 84 design/construction activities during the Polygon 79 closure rebound period. Should any sub-area in Polygon 79 fail the rebound testing, it would be able to be treated simultaneously with Polygon 84, thereby further accelerating the site soil remediation schedule.

The system design is broken down into seven primary subsections which include:

1. Soil Vapor Extraction and Monitoring Wells
2. Extraction Well Header and Lateral Piping
3. Vapor Inlet System
4. Vapor Treatment System
5. Vacuum Extraction Module
6. Electrical Controls and Connections
7. Operable Unit Treatment Area and Security

Figure 2-1 illustrates the configuration of the various SVE treatment system components.

The following sections describe the SVE treatment system process and components currently in place in Polygon 79 that will be used to extract and treat soil vapors from Polygon 84.

2.1 SVE OPERABLE UNIT PROCESS DESCRIPTION

Soils within the boundaries of the Phoenix Goodyear Airport (PGA), Polygon 84 contain chlorinated solvent substances (referred to as solvent). Vapor extraction wells are constructed within the polygon and piped to the SVE operable unit.

The SVE operable unit is designed to remove those solvents from the soils by drawing vapors from the soil to the treatment unit under a vacuum. The SVE system design is based upon the results of pilot testing conducted in 1988. The SVE Operable Unit treatment system final design is contained in the SVE Final Design Document submitted to the U.S. EPA on November 25, 1992. Appendix A of this manual contains the SVE system drawings.

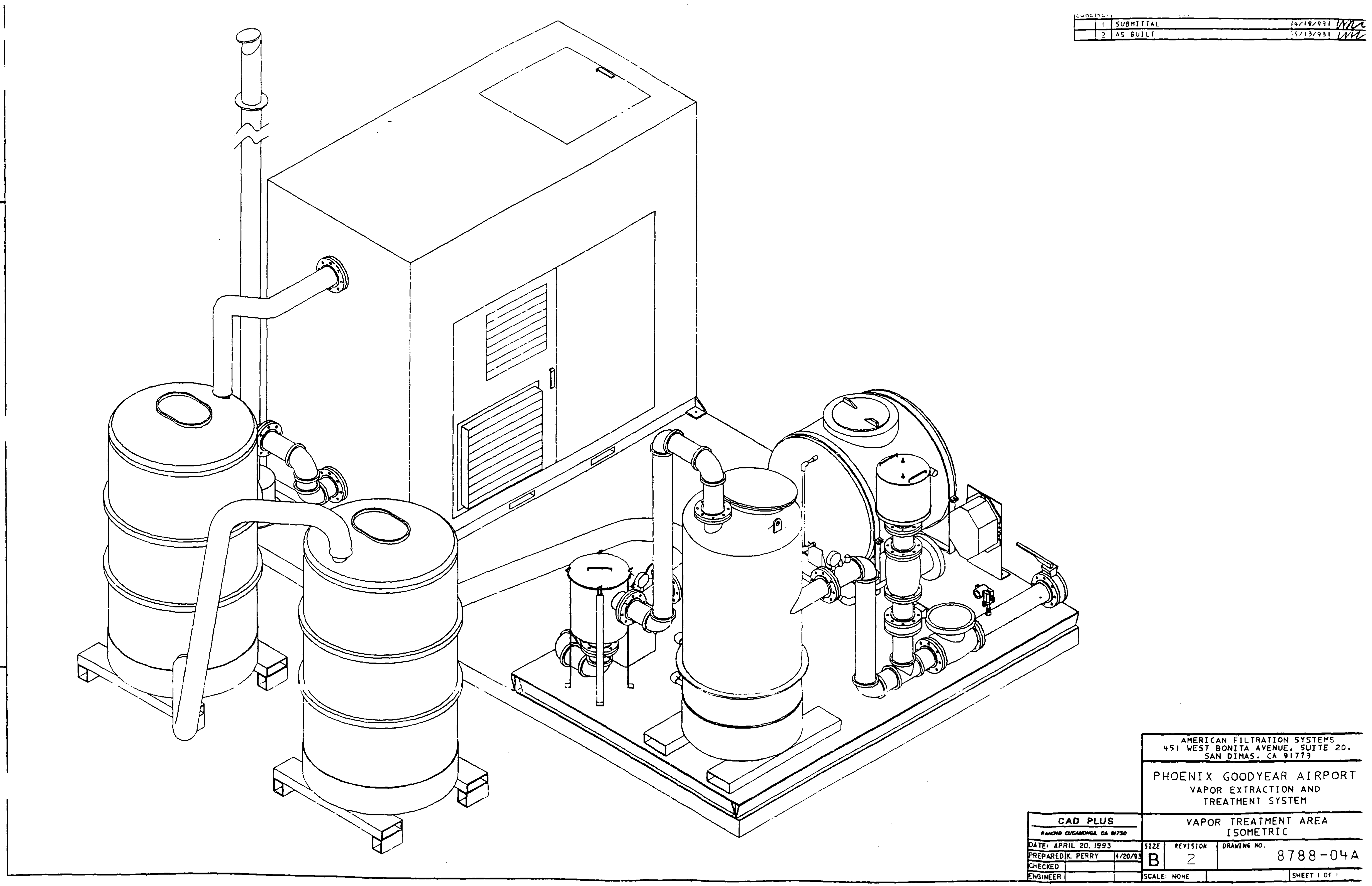

1 SUBMITTAL 4/19/93
2 AS BUILT 5/13/93
AMERICAN FILTRATION SYSTEMS
451 WEST BONITA AVENUE, SUITE 20.
SAN DIMAS. CA 91773
PHOENIX GOODYEAR AIRPORT
VAPOR EXTRACTION AND
TREATMENT SYSTEM
CAD PLUS
RANCHO CUCAMONGA, CA 91730
VAPOR TREATMENT AREA
ISOMETRIC
DATE: APRIL 20. 1993
PREPARED K. PERRY 4/20/93
CHECKED
ENGINEER
SIZE B
REVISION 2
DRAWING NO. 8788-04A
SCALE: NONE
SHEET 1 OF 1

FIGURE 2-1

Solvent laden soil vapors enter the treatment area via a one-way check valve (CV-1). Flow is measured downstream of the check valve. An air blending station is provided to dilute the solvent laden vapor stream. The air blending station contains a filter to protect the treatment system from wind borne debris and a silencer to reduce noise levels from air entering the system piping. Solvent concentrations are measured at this point. Flow is also measured downstream of the air blending station.

Condensible liquids, mostly water, are removed from the solvent laden vapor stream by a vapor/liquid separator. Provisions are made for removing collected liquids from the vapor/liquid separator automatically using level controls and a pump. A condensed liquid storage tank is provided to hold the condensed liquids for disposal.

Dry solvent laden vapors are passed through a particulate filter and then into two activated carbon vessels in series, where the solvents are removed. The series arrangement of the carbon vessels ensures that solvent vapors are not released to the atmosphere in the event that the adsorption capacity of the first, or primary, carbon bed is exceeded. A hydrocarbon monitor is provided to monitor for breakthrough of the first bed.

The vacuum extraction blower downstream of the carbon vessels provides the suction necessary to remove the solvent vapors from the soil. The extraction blower is connected to the system with expansion joints to protect the rest of the system from vibration. Clean soil vapors are exhausted from the extraction blower via a muffled stack.

The SVE operable unit is provided with automated instrumentation and controls. System performance can be monitored remotely by telemetry. If necessary, the system can be shut down from the remote monitoring station. However, the system must be started locally at the treatment area. P&ID Drawings 84-E-2 and 84-E-3 (Appendix A) show the treatment system operation and key components. The remainder of this section identifies the key SVE operable components and describes how they should be operated and maintained.

2.2 VAPOR INLET SYSTEM

The vapor inlet system consists of an air blending station and a vapor/liquid separator. A block valve (BV-1) and check valve (CV-1) are provided on the vapor inlet skid to isolate the treatment system from the extraction wells and to prevent backflow from the treatment system into the extraction wells, respectively. The entire vapor inlet system is mounted on a 8-foot by 12-foot structural steel skid equipped with a non-skid deck and lifting lugs.

2.2.1 Air Blending Station

Solvent laden air passing the block valve (BV-1) and check valve (CV-1) enters the vapor inlet portion of the treatment system. An air blending station, to provide ambient air to the system, is located just prior to the vapor/liquid separator. The station is composed of a 6-inch tee, a butterfly valve (BFV-1) which opens to the atmosphere, and a Solberg F Series filter/silencer. The Solberg F Series filter/silencer is provided to protect the SVE system from wind borne debris and reduce noise from the air stream entering the piping. The butterfly valve (BFV-1) should remain closed when the system is not in operation or when the entire treatment stream is from the extraction wells. See Drawing 84-E-2.

2.2.2 Vapor/Liquid Separation

Vapor/liquid separation occurs in a centrifugal force pressure drop vapor/liquid separator unit with internal baffling and a discharge coalescing filter. The vapor/liquid separator contains a 150-gallon water reservoir for water storage. An automatically actuated pump (P-1) is used to evacuate the vapor/liquid separator reservoir into a cross-linked high density polypropylene 240-gallon condensed liquid storage tank. The materials of tank construction are compatible with expected contaminants which might be present in the condensed liquid.

Liquid level controls are contained in the separator unit which control pump P-1 that evacuates the water reservoir, as well as a high level shut down switch. The separator is made of carbon steel construction that contains a rust-inhibiting coating and is manufactured by Global Technologies, Inc.

The water pump (P-1) is Model 5 self-priming aluminum centrifugal pump manufactured by MP Flomax and driven by a 0.5 hp, 1,000 rpm Marathon Electric standard induction explosion proof motor. The pump is rated for 20 gpm at 20 feet of water head.

The liquid level in the vapor/liquid separator and the condensed liquid 240-gallon storage tank actuates Magnetrol switches. Each switch is pivot mounted, with a float on one end and a magnet on the other. When the liquid level either rises or falls past the switch location, the magnet moves. An electric switch adjacent to the magnet is actuated by the movement of the magnet. The Magnetrol switches actuated in this manner are vapor/water separator switches LSL-03, LSH-03 and LSHH-03 and condensed liquid storage tank switch LSHH-05. A high high level switch contained in the condensed liquid storage tank is also used as a shut down switch.

Flow element and transmitter, FE-07/FT-07 are located upstream of the air blending station.

2.3 VAPOR TREATMENT SYSTEM

The vapor treatment system consists of carbon canisters, connecting pipe spool pieces, reinforced flexible tubing and vacuum relief vents. The carbon canisters are designed to be placed on a firm surface, such as asphalt or pavement, and connected in series using flexible connecting tubing.

2.3.1 Carbon Canisters

The carbon canisters are manufactured by Fabricated Metals, Inc. and consist of two granular activated carbon (GAC) filled adsorber vessels in series (GAC-1, primary and GAC-2, secondary), and associated piping, duct work and valves. The adsorber vessels are cylindrical with dished ends and stand vertical. Each is nominally 4 feet outside diameter and 7.5 feet high. The forklift channeled skids on the bottom and connection fittings at the top make the overall height of each carbon vessel 8 feet 9.25 inches. The carbon adsorber vessels are of carbon steel construction. Each tank contains nominally 2,000 pounds of activated carbon supported by 18-gage stainless steel screens. The interior of the adsorber tanks are coated with an acid-resistent epoxy coating. The vessels are rated to 16-inch Hg vacuum. A third standby carbon canister, GAC-3, is provided on-site for backup.

2.4 VACUUM EXTRACTION MODULE (VEM)

The vacuum extraction module consists of an in-line particulate filter, vacuum extraction blower and 50 hp electric motor, expansion joints (upstream and downstream of blower), discharge silencer, sump and exhaust stack. A blower control panel is mounted on the blower enclosure on a box tube frame (see Drawing 84-E-3, Appendix A). Expansion joints are provided to isolate motor vibration from other portions of the SVE operable unit. The extraction blower sound attenuated enclosure and discharge silencer are designed to reduce noise levels as required. The discharge stack is provided with a hinged exhaust flapper and sump to prevent water/precipitation from flowing back into the blower.

Flow is measured upstream of the in-line filter (FE-14/FI-14). Differential pressure is indicated across the in-line filter (DPI-22) and temperature and pressure are measured both upstream and downstream of the extraction blower.

2.4.1 Extraction Blower

The extraction blower is an M-D Pneumatics Model 5514, 2-lobe rotary positive type extraction blower. The blower is driven by a 50 hp, TEFC motor via a V-belt drive. The blower is rated for 500 scfm at 15-inch Hg vacuum and 2 psi pressure. Protective devices built into the motor are designed to shut the system down in the event of high motor winding current. The blower contains a vapor recirculation line and flow adjustment valve (R-1) for minor system flow adjustment.

2.5 ELECTRICAL CONTROL SYSTEM AND POWER DISTRIBUTION MODULE

2.5.1 Electrical Control System

The electrical control system consists of skid mounted (shares skid with the power distribution module) remote terminal unit in a NEMA 7 rated enclosure. The electrical control system contains the HNu Model 201 photoionization detector continuous gas monitor, a Control Microsystems TeleSAFE 6000 control and data acquisition unit and various supporting electronic components. A remote IBM PC compatible MS DOS based computer system with a 2400 baud modem for connection via standard telephone line is used to remotely monitor and shut down the SVE Operable Unit.

2.5.2 Power Distribution Module

The power distribution module ties into the existing site electrical substation and distributes power to the various electrical usage components of the SVE Operable Unit. These include the extraction blower, the electrical control and telemetry panel "A", the separator drain pump and the electrical control panel "B".

The power distribution module is contained within a skid mounted cabinet (skid shared with the electrical control system). Power from the site substation at 480 volts is routed through a 200 ampere circuit breaker into a power block. The 480-volt, 3-phase power from the power block is sent to a 150 ampere circuit breaker and then to a size 3 motor starter for the extraction blower motor. A 15 ampere circuit breaker, connected to two legs of the power leaving the power block, is brought to a transformer, where electrical services is provided for a lighting panel and the separator pump motor controller. The lighting panel provides power for telemetry and controls, as well as auxiliary power for other desired services including utility outlets and lighting.

Metcalf & Eddy, Inc. prepared the Soil Vapor Extraction (SVE) operable unit design for the operable unit installed in Polygon 79 in conformance with Section VII-D, Subsections 8a through 8j of the 1990 Consent Decree. The SVE operable unit design takes into account the extraction, conveyance, treatment, and discharge of TCE and related solvent vapors present in the site vadose zone from a sub-areas of the site. Sub-area is defined here as a polygon with numerous soil vapor extraction wells. Once the polygon commences SVE operable unit operations, sub-area is redefined in the 1990 Consent Decree as that area treated by a single operating SVE well. The SVE operable unit has been designed to treat Polygon 84 concurrently with Polygon 79.

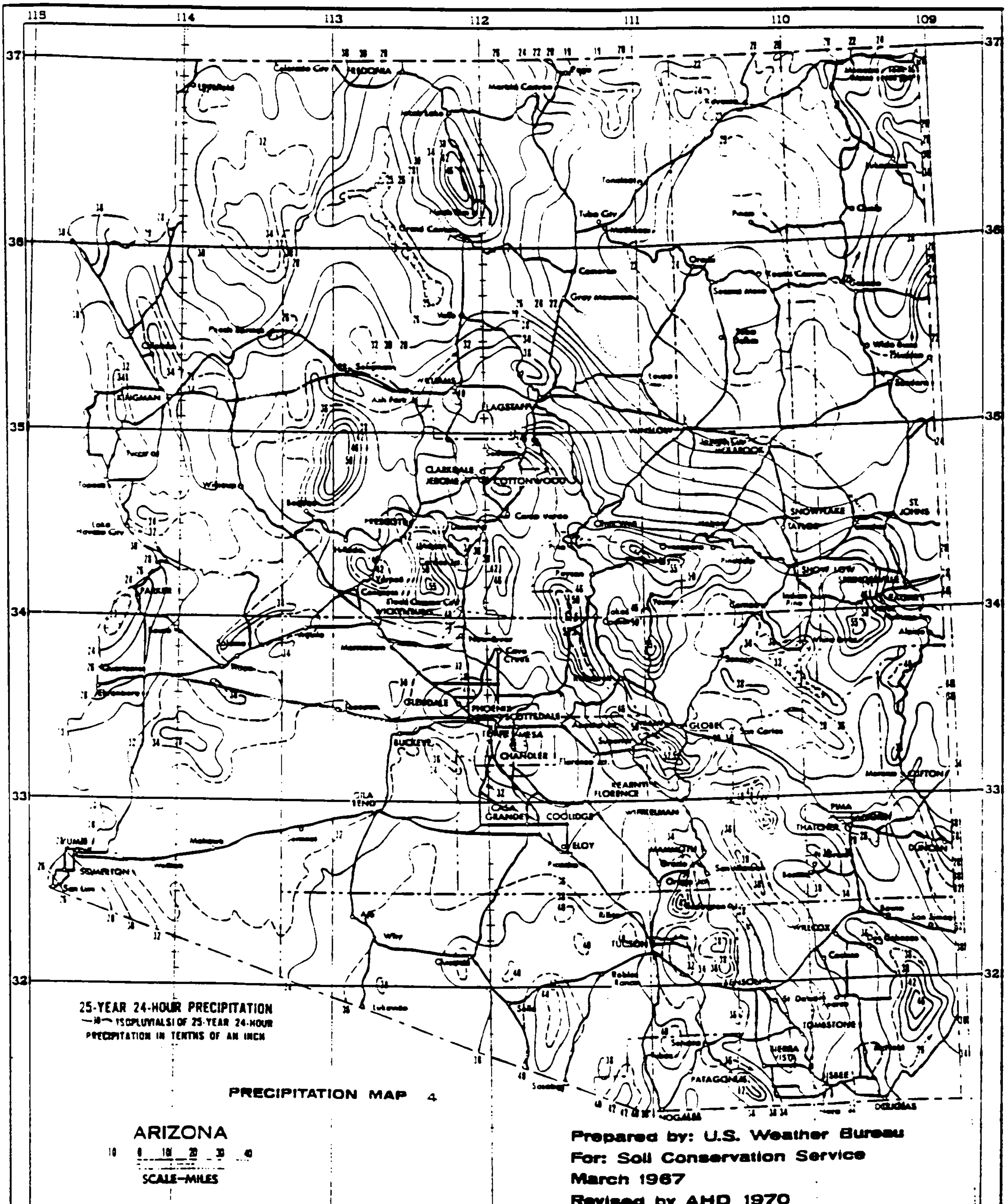
Detailed SVE operable unit Drawings and Specifications are provided in Appendix A, Plans and Specifications of this report. A more detailed discussion of the SVE operable unit design and Operations and Maintenance is presented in the November 1992 Design Report and the November 1993 O&M Manual for Polygon 79.

2.6 OPERABLE UNIT TREATMENT AREA AND SECURITY

The operable unit treatment area has been installed to provide a secure and structurally sound area for the treatment system to be located. Drawing 84-M-1, Detail 1 (Appendix A) illustrates the operable unit treatment area.

A total of two primary skids, the air/water separator skid and the blower skid are mounted and anchored to the site concrete pavement for structural and vibrational concerns. The concrete pavement is approximately 10 feet wide by 18 feet long. Figure 2-2 was used to determine the water drainage characteristics for a 25-year, 24-hour rain storm event. Due to the small treatment area size, no drainage control was deemed necessary. The operable unit skids are mounted on the concrete pad area as illustrated in Drawing 84-M-1, Detail 1. The skids are anchored through the use of anchor bolts formed a minimum of 3 inches in the concrete. Rubber vibration dampening pads are used between the blower skid and the concrete to minimize vibrations and noise.

The carbon vessel skids are located adjacent to the VEM closest to the treatment area gates to facilitate monitoring and carbon bed replacement and/or regeneration. The carbon beds are piped above ground using vacuum-rated flexible tubing to the air/water separator and vacuum blower as indicated in Drawing 84-M-1, Detail 1. The flexible tubing facilitates easy connection of the beds during servicing. Sufficient room is available around the operable unit components for operators and service technicians to maintain the operable unit equipment. A single junction box is installed on the vacuum blower side of the pad containing all operable unit electrical and control wiring. The junction box is rated for Class I, Division II operation.



25-YEAR 24-HOUR PRECIPITATION
ISOPLUVIALS OF 25-YEAR 24-HOUR PRECIPITATION IN TENTHS OF AN INCH
PRECIPITATION MAP 4
ARIZONA
SCALE-MILES
Prepared by: U.S. Weather Bureau
For: Soil Conservation Service
March 1967
Revised by AHD 1970
KINGMAN
FLAGSTAFF
WINSLOW
HOLBROOK
CLARKDALE
JEROME
COTTONWOOD
PRESCOTT
SNOWFLAKE
ST. JOHNS
SHOW LOW
PARKER
GLENDALE
PHOENIX
SCOTTSDALE
TEMPE
MESA
CHANDLER
BUCKEYE
GLOBE
FLORENCE
CASA GRANDE
COOLIDGE
ELOY
MAMMOTH
TUCSON
SOMERTON
THATCHER
PIMA
DUNCAN
CLIFTON
BENSON
TOMBSTONE
SIERRA VISTA
PATAGONIA
NOGALES
DOUGLAS

FIGURE 2-2

The electrical control panel, power distribution module, and the telemetry unit is located on a separate concrete pad of similar construction outside the Class I, Division II area. See Drawing 84-M-1, Detail 1. The dimensions of the electrical control pad are approximately 10 feet by 5 feet. A fence with locking gate is located around the electrical control panels to prevent tampering and damage from the weather. Drawing 84-E-6 illustrates the configuration of the electrical control panels.

For operable unit security, an 8-foot, chain link fence is located around the operable unit and includes two 5-foot wide swing gates for truck access. For additional security, concrete-filled steel posts are located at the corners of the treatment and electrical pad to prevent vehicle damage. Drawing 84-M-1, Detail 1 illustrates the treatment area configuration including the fence and protection posts.

Signs are posted on the security fence and on other potential safety hazards in the project area. Entry rules, which will require personnel entering the fenced area to check in with project management, are posted near the entrance gate. Signs within the treatment area identify potential electrical and chemical hazards and hot surfaces. Warnings of hazardous and combustible materials are posted. Other warning signs, such as eye, foot, and hearing protection requirements are posted as appropriate. OSHA training is required for site entry.

SECTION THREE

SOIL VAPOR EXTRACTION AND MONITORING WELLS

In accordance with the site Record of Decision (ROD), Polygon 79 contains a total of four sub-areas, and therefore, a total of four extraction/monitoring well pairs. The number of sub-areas was calculated from the RI/FS data. Operation of the SVE system in Polygon 79 revealed that the sub-area design radius of influence of 100 feet was conservative and that a design radius of 150 feet can be used for subsequent polygon designs. Based on this, Polygon 84 contains a total of three sub-areas that will contain three extraction/monitoring well pairs.

Three extraction/monitoring well pairs are located within the treatment area or polygon. Extraction wells are connected by an underground and aboveground piping network. Monitoring wells are each located within the radius of influence of their associated extraction well. Refer to Appendix A, Drawing 84-C-1 for the well locations. The extraction wells are designated as VEW-84-1 through VEW-84-3. The monitoring wells are designated as VP-84-1 through VP-84-3.

3.1 SOIL VAPOR EXTRACTION WELLS

Soil texture conditions present in the site vadose zone are variable and consist of two subsurface strata. The upper 35 feet of the vadose zone is characterized by fine-grained silts and sands with some clay. These soils contain air conductivities of 1×10^{-6} cm/second as determined by physical soil laboratory analyses conducted in conjunction with Polygon 79 subsurface investigations (Appendix J of the November 25, 1992 Design Manual for Polygon 79). The lower 25 to 30 feet of vadose zone is characterized by coarse sands and gravels that contain air conductivities on the order of 1×10^{-4} cm/sec. To accommodate the different soil types in the vadose zone, a dual-well/single borehole design was utilized for Polygon 79. It was anticipated that the dual well/single borehole design would allow for the independent flow and vacuum regulation of extracted vapor from the upper fine and lower coarse vadose zone areas as needed and would be preferred to a single fully-penetrating well because the fully-penetrating well will preferentially draw soil vapors from the lower coarse vadose zone, and significantly reduce the effective induced vacuum in the upper fine vadose zone. However, field operation of Polygon 79 extraction wells and the SVE operable unit demonstrated that a fully-penetrating well would effectively draw vapors from both zones and be easier to operate and adjust while accomplishing the same remediation goals. Therefore, single completion wells screened through both strata will be used for Polygon 84.

The single extraction well design requires the installation of a nominal 10-inch diameter boring to a depth of approximately 60 feet below grade. The boring will be advanced through the use of a hollow stem auger, drilling rig. The drilling of the well will use no fluids with the exception of air to prevent vadose zone formation clogging. Once the boring has been advanced to the total depth, the drilling casing will temporarily remain in place while the extraction well is constructed. Table 3-1 illustrates the SVE operable unit well parameters. Drawing 84-M-5, Detail 6 illustrates the construction of the fully-penetrating soil vapor extraction well. The total depth of the boring will be

TABLE 3-1
SOIL VAPOR EXTRACTION WELL PARAMETERS

Parameter	Specification
Well Boring Depth	50 to 55 feet
Well Boring Diameter	10 inches (nominal) O.D.; 6-14 inch I.D.
Well Drilling Method	Hollow stem
Well Screen	3-inch Dia., Sch 40 PVC, flush thread, 0.02-inch Machine Slot
Well Screen Depth	10 to 55 feet b.g.s.
Screen Gravel Pack	Colorado 8-12 silica or 3/8-inch washed round pea stone
Bottom Hole Seal	8-12 Wyoming bentonite crumbles, (8-12 sieve) 6 inches min.
Well Sand Seal	Colorado #30 sand, 1.0 foot (or equivalent)
Well Annular Seal	Wyoming 8-12 bentonite crumbles, min. 1.5 feet placed and hydrated in 6-inch lifts.
Annular Seal to Road Box	Portland neat cement with 10% powder volclay.
Road Box	36-inch by 36-inch steel vault w/hinge lid, H-20 rating.
Road Box Completion	Concrete aggregate, 3,000 psi commercial, no additives, slope apron to grade.
Well Head Connections	3-inch Dia, Sch. 40/80 PVC fittings, true-union Ball valves, socket connection
Well Instrumentation	2-3/8 inch, 2-1/4 inch, 1-3/4 inch compression fittings for flow, pressure, concentration measurement

adjusted accordingly to ensure that the entire screened interval is in the vadose zone and does not intersect the water table.

Prior to well construction, the bottom of the borehole will be checked for groundwater and sealed to prevent a direct conduit for ground water/capillary water to migrate to the extraction well. The borehole bottom will be sealed with a 6-inch lift of Wyoming 8-20 sieve bentonite crumbles. The bentonite will be hydrated in place via a 3/4 inch tremie pipe by 1.0 gallon of de-ionized water. Once the seal is fully hydrated as confirmed by a weighted measuring tape, the lower extraction well will be constructed.

The extraction well screen will extend from 10 to approximately 60 feet below ground surface (bgs). Should the capillary fringe water table be encountered at a depth of less than 60 feet, the well screen will be shortened so that it does not extend into the capillary fringe. As specified in Table 3-1, 3-inch diameter, Schedule 40 PVC well materials will be used. All joints will be flush threaded and the screen will be machine slotted with 0.02 inch openings. The remainder of the well to grade will consist of Schedule 40 PVC casing.

The well gravel pack will consist of Colorado 8-12 sieve silica sand or 3/8 inch washed round pea stone to 1 foot above the screen top. While the gravel pack is in place, the drilling casing will be pulled to ensure a competent gravel pack and minimize vadose zone cave in. A 1-foot sand seal of Colorado No. 30 silica sand will be placed on top of the 8-12 silica to prevent the bentonite seal from being drawn into the 8-12 silica under extraction operations. If 3/8 inch washed pea stone is used, the sand seal will not be used, and two additional 6-inch lifts of Wyoming 8-12 bentonite crumbles will be installed, each hydrated with deionized water using a 3/4 inch tremie pipe.

A bentonite seal will then be placed in the boring to seal the extraction well. The bentonite seal will consist of a minimum 1.5 feet of Wyoming 8-20 sieve bentonite crumbles placed and hydrated in 6-inch lifts. Each lift will be checked for proper moisture content with a tape. Water addition will be adjusted in the field as necessary. Once the bentonite seal has been placed, the remainder of the boring will be sealed with an API Class G Portland cement grout with a 10 to 15% powdered bentonite amendment. Following grout placement, the ground around the extraction well will be prepared for well head completion. Well completions use a vaulted underground method as illustrated on Drawing 84-M-5, Detail 6 in Appendix A.

Roadway or floor vault completion will consist of excavating around the SVE well to a depth of approximately 2 feet 9 inches. Drawing 84-M-5, Detail 3 illustrates the construction configuration of the well vault. Once the excavation is complete, the base of the excavation will be compacted to 95%. After the base has been compacted, the well vault will be set. The cover of the vault should be approximately 1 inch above grade for surface water drainage. Following well vault placement, the final concrete apron should be poured and worked to slope away from the vault outer lip for surface water drainage diversion. A 3,000 psi commercial mix, no-additive concrete should be used. Prior to backfilling and concrete installation, the 4-inch diameter well header should be terminated and capped inside the well vault.

Connection of the extraction wells to the 4-inch lateral will be accomplished through the use of 3-inch diameter Schedule 40 or 80 PVC fittings. Drawing 84-M-5, Detail 6 illustrates the connection of the SVE wells to the well header. A valve has been installed in the bottom of the 4-inch lateral for condensate drainage for vaulted installations. Lateral piping is sloped at approximately 1% (0.01 feet per foot) toward the extraction wells so that any collected water from condensation inside the piping during periods of shut-down will automatically drain back to the extraction well. The November 5, 1993 Final SVE Operation and Maintenance Manual for Polygon 79 contains detailed information on the operation and maintenance of the SVE wells.

3.2 SOIL VAPOR MONITORING WELLS

Each soil vapor extraction well requires a paired monitoring well for vacuum drawdown adjustment as well as remedial monitoring compliance for closure.

Each monitoring well will be constructed as a cluster of four sample tubes, screened at four different depths to monitor vapor pressure and concentrations at varying strata. See Drawing 84-M-1, Detail 7 in Appendix A.

A single soil boring will be drilled from ground surface to just above the present elevation of the groundwater table in each of the three Polygon 84 sub-areas using a hollow-stem auger drilling rig. during drilling, soil core sampling at 5-foot intervals will be performed for lithologic confirmation of the site's vadose zone lithologic layers. Soil samples will be analyzed for VOC concentrations using a photoionization detector (PID) calibrated to TCE using the headspace method (see Appendix H, Section 4.4).

Following the drilling and sampling of each boring, Goodyear will convert each completed boring into a depth-specific vadose zone/soil vapor monitoring cluster well. The clustered well configuration will consist of four individually completed vapor wells at specific depths within the vadose zone so as to maximize vertical soil vapor monitoring coverage (see Figure 3-1).

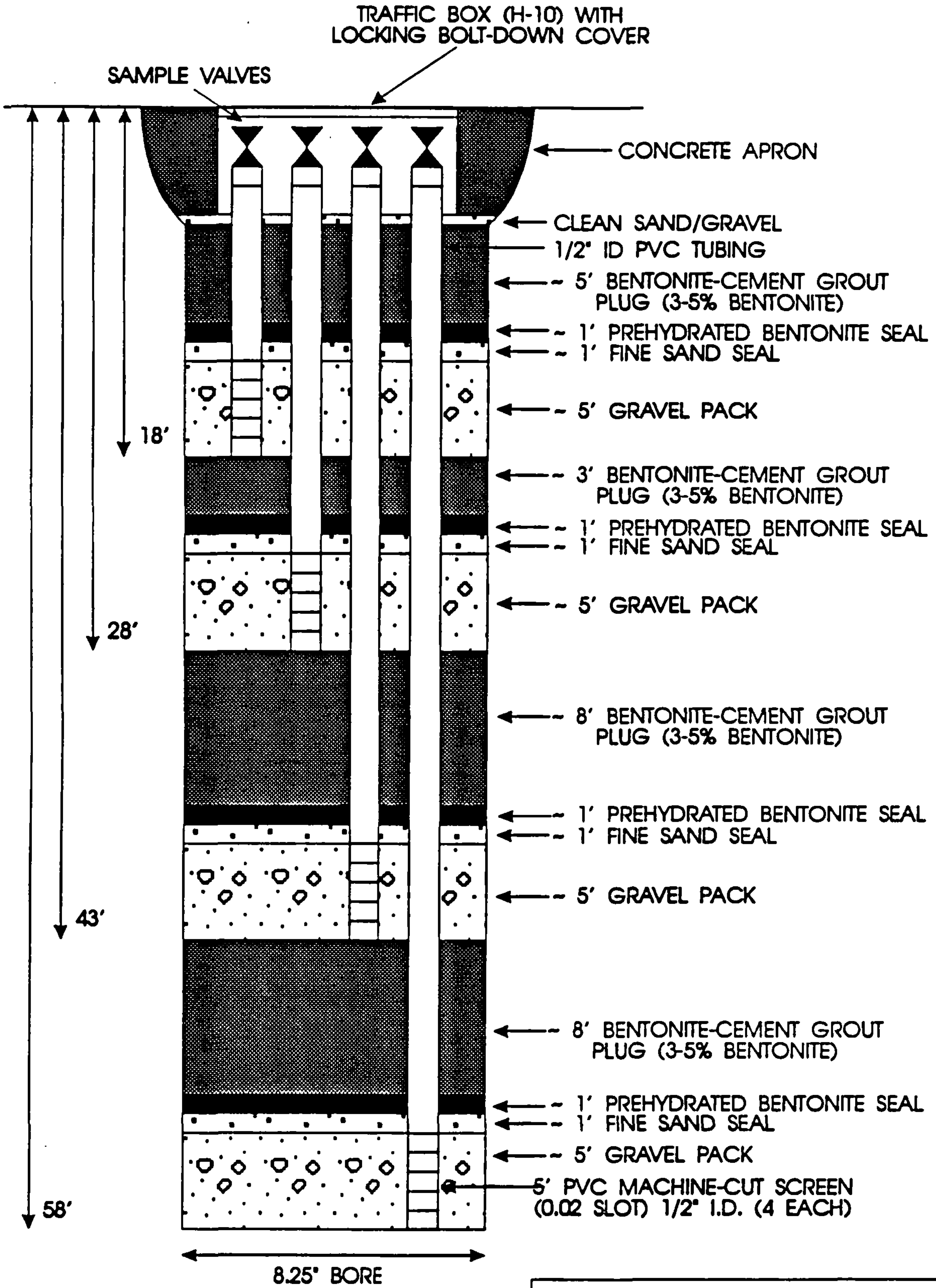
Soil samples will be collected and logged from the soil borings at 5-foot intervals using a hammer driven, 24-inch length, 2-inch diameter by 3-inch length brass liners. Liners from each 5-foot soil sampling interval collected will be field screened and logged by a site geologist. Vertical profiling of soil headspace concentrations with depth is important as it relates to the PGA site since contaminants would be expected to migrate from the two distinct sources in the vadose zone:

1. Surface soils resulting from surface spills and releases.

2. The capillary fringe overlaying the groundwater which would result from off-gassing of volatiles in contaminated groundwater.

By vertically profiling soil concentrations, Goodyear can identify and isolate sources of contamination and target these areas for VLEACH and mixing cell modelling and subsequent soil vapor monitoring and SVE remedy.

Soil vapor monitoring well construction will immediately follow the drilling and sampling of the borings. Three monitoring wells, constructed in a nested fashion such that each of the four wells is installed independently of one another are proposed for completion of each boring. Each well will be installed with 0.5-inch diameter, Schedule 40 PVC casing, slotted with a 5-foot length screened interval at the base with blank casing extending upwards to just aboveground surface. Figure 3-1 illustrates a typical soil vapor monitoring cluster. The proposed construction using 5-foot screened lengths were selected to maximize the total screened depth of vadose zone soil vapor monitoring in each boring. Using this construction, a total of 20 feet of screen will be open to soil vapor sampling which is over 30% coverage of the entire vadose zone. The proposed screened intervals are as follows: 13 to 18 feet, 23 to 28 feet, 38 to 43 feet, and 53 to 58 feet below ground surface (see Figure 3-1). The rationale for proposing these screened intervals is to characterize the upper-fine vadose zone soils (13 to 18 feet), the approximate interface between the upper-fine and lower coarse vadose zone soils (23 to 28 feet), and to characterize the lower coarse soils and the capillary fringe (38 to 43 feet, and 53 to 58 feet, respectively). The soil headspace analytical results will be used in conjunction with field observations gathered during boring activities in order to fine-tune and potentially modify the screened interval schedule. It is noted herein that no screened interval, based on these additional data, will be moved more than 5 linear feet in either direction from its proposed location.



SCHEMATIC DIAGRAM OF TYPICAL VACUUM MONITORING CLUSTER CONSTRUCTION

M&E Metcalf & Eddy

Drawn by: J. Weidmann	Job Number: 006791	Date: 20 March 1992
Checked by: S. Zachary		Figure Number: 3-1

An idealized diagram of a typical vacuum monitoring/soil vapor monitoring well cluster is provided as Figure 3-1. The wells will be constructed in the order of greatest depth first, and proceeding upwards until the shallowest well installation is completed. A gravel pack consisting of Colorado 8-12 silica will be installed around the screened interval, with a Colorado No. 30 sand seal extending to approximately 0.5-foot above and below each screened interval to prevent the bentonite seal from intruding through the gravel and sealing off the well screen. Above the sand seal, a 1-foot thick bentonite seal of Wyoming 8-20 sieve bentonite crumbles will be constructed to seal each well from the influence of other wells constructed within the bore hole. Above each bentonite seal, 10% bentonite-cement mixture will be tremied to a depth corresponding to the next screening interval. At this stage, the construction process will be repeated until the shallowest well has been installed.

To complete each nested well installation, bentonite-cement mixture will be tremied to a depth of approximately 3 feet below grade onto which a 1-foot thick layer of sand/gravel will be placed. A concrete envelope onto which a locking steel monument box will be secured to complete the construction of each well. Each well will be labelled by a unique designation indicating its location, total depth, and screened depth interval. A well construction diagram will be completed for each nested construction and will be included in the Draft and Final Polygon 84 O&M Manuals.

SECTION FOUR

EXTRACTION WELL PIPING

As specified in Section Three, Polygon 84 will contain a total of three SVE extraction wells for remediation. Each of the three soil vapor extraction wells will be connected to the in-place soil vapor extraction operable unit located in Polygon 79 by a main 6-inch Schedule 40 and 80 PVC header and its associated laterals. The SVE piping layout is shown on Drawing 84-C-1. This header and lateral network will be placed predominantly above grade except where piping must cross facility roadways or building operations. All subsurface piping will be buried a minimum of 20 inches below grade. See Drawings 84-M-3 and 84-M-6, Details 9 and 29, respectively.

Lateral piping, both above and below ground will be installed to slope to the extraction wells at 0.01 feet per foot, or 1%. The pipe header and laterals are designed to be installed and operated under a continuous operating condition of 16 inches of mercury (Hg) vacuum and a flow rate of 500 scfm.

Where piping will be placed above ground, the pipe will be supported by hanging from building rafters and sloped through the use of unistrut or concrete (or equivalent) hanging supports. The PVC pipe will be secured to the supports through the use of pipe straps, hangars, and unistrut channels. See Drawing 84-M-4, Details 14, 15 and 19. All PVC pipe will be supported in accordance with the size/schedule/span matrix indicated on Drawing 84-M-4.

Installation of the PVC pipe will be in accordance with the pipe manufacturer's guidelines by a state-licensed general/mechanical contractor. The pipe will be installed within trenches as illustrated in Drawing 84-M-3, Detail 9 and Drawing 84-M-6, Detail 29. All PVC pipe will be bell-ended and will be solvent welded in the field. Rachet straps will be used to be sure that all solvent-welded joints are tight and do not separate during cement curing. Prior to cementing, two coats of primer will be applied to the PVC joints to assure quality solvent welds. Once the piping has been welded, the ends will be sealed after a minimum of 6 hours and the piping will be vacuum tested. Once the vacuum test is confirmed, the piping in the trenches will be backfilled with native material in lifts and compacted to 90 to 95 percent. After compaction, the piping will be retested for leaks. Any leaks will be located and repaired prior to site commissioning. See Drawing 84-M-3, Detail 9 and Drawing 84-M-6, Detail 29. All trench areas will be completed at grade with 3,000 psi cement with no additives. A detailed description of piping layout is provided below.

The main 6-inch PVC header connects to the SVE operable unit via an existing camlock/hose connection and branches into two separate 6-inch PVC headers. One 6-inch I.D. Schedule 40 PVC header is in-place and collects soil vapor from Polygon 79 wells. The existing treatment unit/header connection will be modified to serve the proposed 6-inch header for Polygon 84 in addition to the Polygon 79 header. See Drawing 84-M-6, Detail 30 and Drawing 84-M-7, Section A-A'. The 6-inch PVC header travels vertically up the exterior wall of Building No. 1 and then horizontally to the north along the building face, suspended from roof rafters via pipe hangers. See Drawing 84-M-7, Section A-A'. Schedule 80 PVC piping will be used for all vertical and subsurface pipe runs. Schedule 40 PVC piping will be used for all aboveground horizontal runs. See Drawing 84-M-4, Detail 14 for pipe hanger supports and spacing. At the north corner of Building No. 1, the header pipe travels vertically down the west exterior wall to the ground surface. Refer to Drawing 84-M-7, Section A-A' for the schematic layout of piping along Building No. 1. Due to the length of piping along Building 1, an expansion loop will be required to accommodate thermal pipe expansion and contraction. See Drawing 84-M-7, Detail 31, Section A-A'.

The 6-inch pipe will then be installed below grade, the invert of the 6-inch diameter to be buried a minimum of 30 inches below grade. An underground clean out "T" will be installed in the subsurface header to remove excessive water and sediment if needed. See Drawing 84-M-6, Detail 27. A 6-inch by 4-inch reducer will be installed after the 90° elbow at the invert and the 4-inch diameter Schedule 80 header will travel north below ground to a traffic vault located at the southwest corner of Building No. 6. Refer to Drawing 84-M-6, Details 27, and 25 for underground roadway and vault details. See Drawing 84-M-3, Detail 9 for a typical trench section.

Inside the traffic vault, a 4-inch Schedule 80 PVC lateral, which serves vapor extraction well VEW-84-2, connects to the header pipe. This lateral travels west below grade and connects with VEW-84-2 in a traffic vault below grade. See Drawing 84-M-6, Detail 29 for a typical trench section; Drawing 84-M-2, Details 6 and 3 for extraction well and vault details and 84-C-1 for the well and piping location.

From the traffic vault, the header surfaces and continues north along Building No. 6 to connect with laterals to VEW-84-1 and VEW-84-2. The SVE piping layout for Building No. 6 is shown on Sections B-B' and C-C' of Drawing 84-M-8. See Drawing 84-M-7, Detail 32 for detail of the subsurface header riser at Building No. 6. After surfacing, the 4-inch Schedule 80 header travels up the exterior building wall, is piped through the wall, and continues up along the south interior wall to the building rafters, secured via pipe supports (see Drawing 84-M-4, Detail 15). The wall pass through is shown on Drawing 84-M-6, Detail 26.

The header continues north, suspended from the building rafters and terminates at the junction of two laterals which serve VEW-84-1 and VEW-84-3. The laterals are connected to the header via a tee connection. The lateral to VEW-84-3 continues north along the building rafters, passes through the north exterior wall, and turns and follows the north exterior wall to the ground surface. See Drawing 84-M-4, Details 14 and 15 for pipe hanger and wall support details and Drawing 84-M-8, Section C-C'. A 4-inch by 3-inch reducer is installed in the lateral and the 3-inch lateral connects with VEW-84-3 in a traffic vault below grade. See Drawing 84-M-9, Detail 40, and Drawing 84-M-5, Detail 6.

At the lateral/header tee connection, the 4-inch PVC lateral to VEW-84-1 branches east inside Building No. 6 and follows a wood ceiling support beam to concrete roof support E-2. See Section B-B', Drawing 84-M-8. At E-2, the lateral travels vertically down the column to floor grade, secured by pipe supports (see Drawing 84-M-4, Detail 15). A 4-inch by 3-inch reducer is installed in the lateral and the 3-inch lateral connects with VEW-84-1 in a traffic vault below grade. See Drawing 84-M-9, Detail 40 and Drawing 84-M-5, Detail 6.

All aboveground piping will be installed so as not to interfere with operations on-going within the site buildings. Additionally, where possible, all piping will be installed out of direct sun exposure to minimize moisutre, condensation, and expansion problems.

SECTION FIVE

RESIDUALS MANAGEMENT

Waste products from the installation of SVE wells and the header and lateral piping network will consist of drill cuttings from the soil borings; soil and concrete from trenching where subsurface pipe installation is required; decontamination wastes; and miscellaneous wastes such as gloves, tyvex, etc.

The drill cuttings and any soil generated during trenching not to be backfilled will be stored in lined roll-off bins. Once the roll-off bin has been filled, the soil in the bins will be moved to the southwestern portion of the PGA facility immediately southwest of the Subunit A groundwater treatment plant. The roll-off bins will be unloaded on visqueen sheeting in the U.S. EPA-approved site soil staging area. At the completion of drilling and construction activities, the soil residuals pile will be composite sampled for laboratory analysis via U.S. EPA Method 8010. If the TCE concentrations are less than the site health risk based threshold of 64 mg/Kg, the soil will be spread pending U.S. EPA approval. If the soil concentrations exceed the 64 mg/Kg threshold, the soil will remain in the staging area and rescheduled for composite sampling.

All non-hazardous construction debris including concrete, pipe, wire, and associated materials will be disposed of accordingly off-site by the construction general subcontractor.

Any liquids collected from the decontamination of the drilling rigs and equipment will be temporarily stored in 55-gallon drums. All liquids will be treated through the Subunit A air stripper system. Any sediments collected as a result of decontamination will be mixed with the drill cuttings in the roll-off bins.

The disposal of spent activated carbon or adsorption media will be handled by a licensed carbon or adsorption media contractor or vendor. Options available include transportation to an U.S. EPA-approved disposal facility or regeneration of the carbon by the manufacturer. All spent carbon will be appropriately manifested in accordance with U.S. EPA and Department of Transportation (DOT) regulations.

Miscellaneous wastes such as used health and safety equipment will be put in plastic bags or placed in 55-gallon drums for transport to an approved disposal facility or as common trash for disposal at a local landfill, depending on the level of hazards encountered during the work.

SECTION SIX

SCHEDULE

Upon acceptance of the Polygon 84 Soil Vapor Extraction System Final Design by U.S. EPA, Goodyear will proceed directly with carrying out the stated tasks.

All tasks will be carried out in accordance with the 1990 Consent Decree and its associated appendices as outlined in this document. The main tasks that will be carried out under this SVE Operable Unit Final Design include:

1. Prepare for Polygon 84 bid packages for materials, drilling, and construction services for the SVE Operable Unit.

2. Install Polygon 84 extraction and monitoring wells.

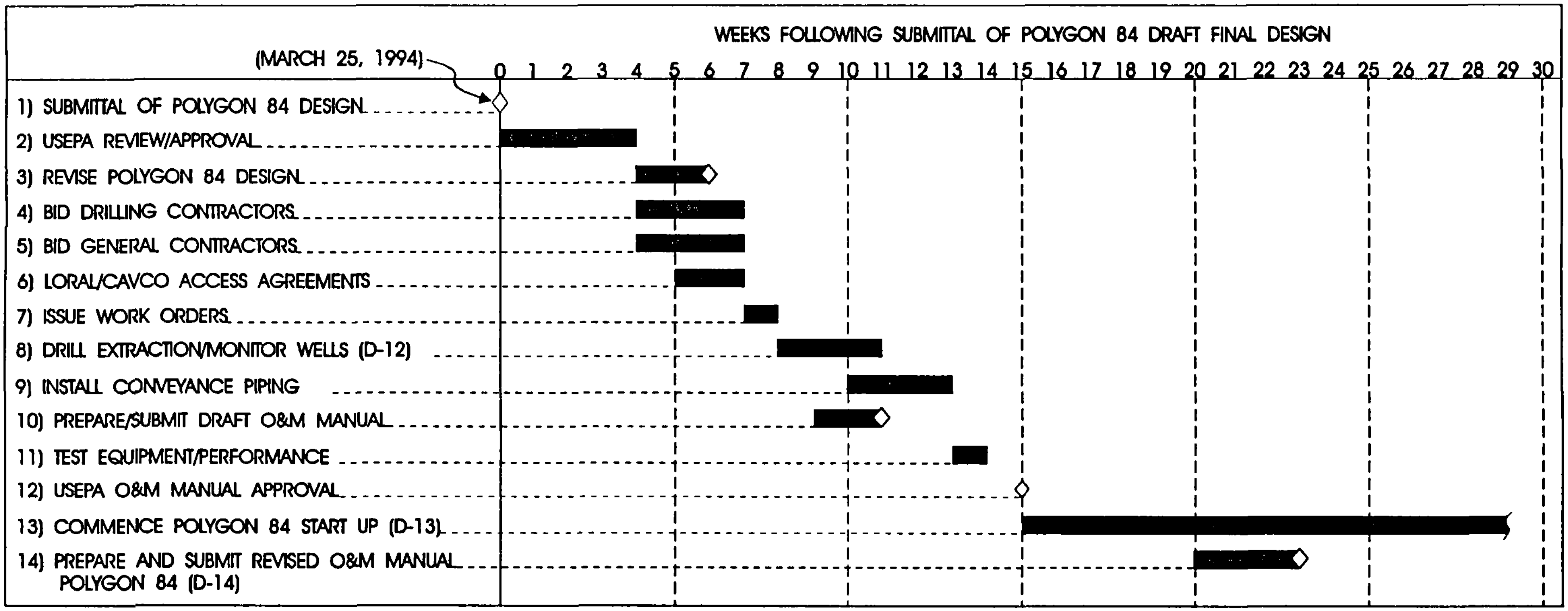
3. Install Polygon 84 piping conveyance system.

4. Test SVE Operable Unit wells in Polygon 84 and SVE treatment system.

5. Initiate operation of the SVE system in Polygon 84 with Polygon 79 if required.

Each of these major schedule items is listed in Figure 6-1 and are broken into week-long segments. M&E will conduct all work in a timely manner in order to complete all of the listed tasks in Figure 6-1 and implement the SVE Final Remedy within 210 days. The 210 day deadline is in accordance with schedule item D-12 of U.S. EPA Revised Consent Decree (letter from C. Copper, U.S. EPA to Ed Waltz of Goodyear Tire and Rubber Co. dated June 19, 1992). Within 60 days after U.S. EPA approval, M&E will commence site construction activities which will include the installation of the soil vapor extraction and monitoring wells as required (Schedule item D-13).

It should be noted that both the bidding/procurement process for the SVE Operable Unit components and construction contractors will be carried out to ensure that Polygon 84 is ready for start-up within the 210 day deadline. Figure 6-2 shows a flow chart of activities that will be conducted at the site in accordance with the project schedule. Every effort will be made to accelerate this schedule since the operable unit treatment system is not being installed in Polygon 84. Start up of Polygon 84 will commence upon completion of well/piping installation and approval of the Polygon 84 Draft O&M Manual, due to U.S. EPA 30 days prior to start up (see Figure 6-1). Polygon 84 operations will commence regardless of the outcome of the May 25,

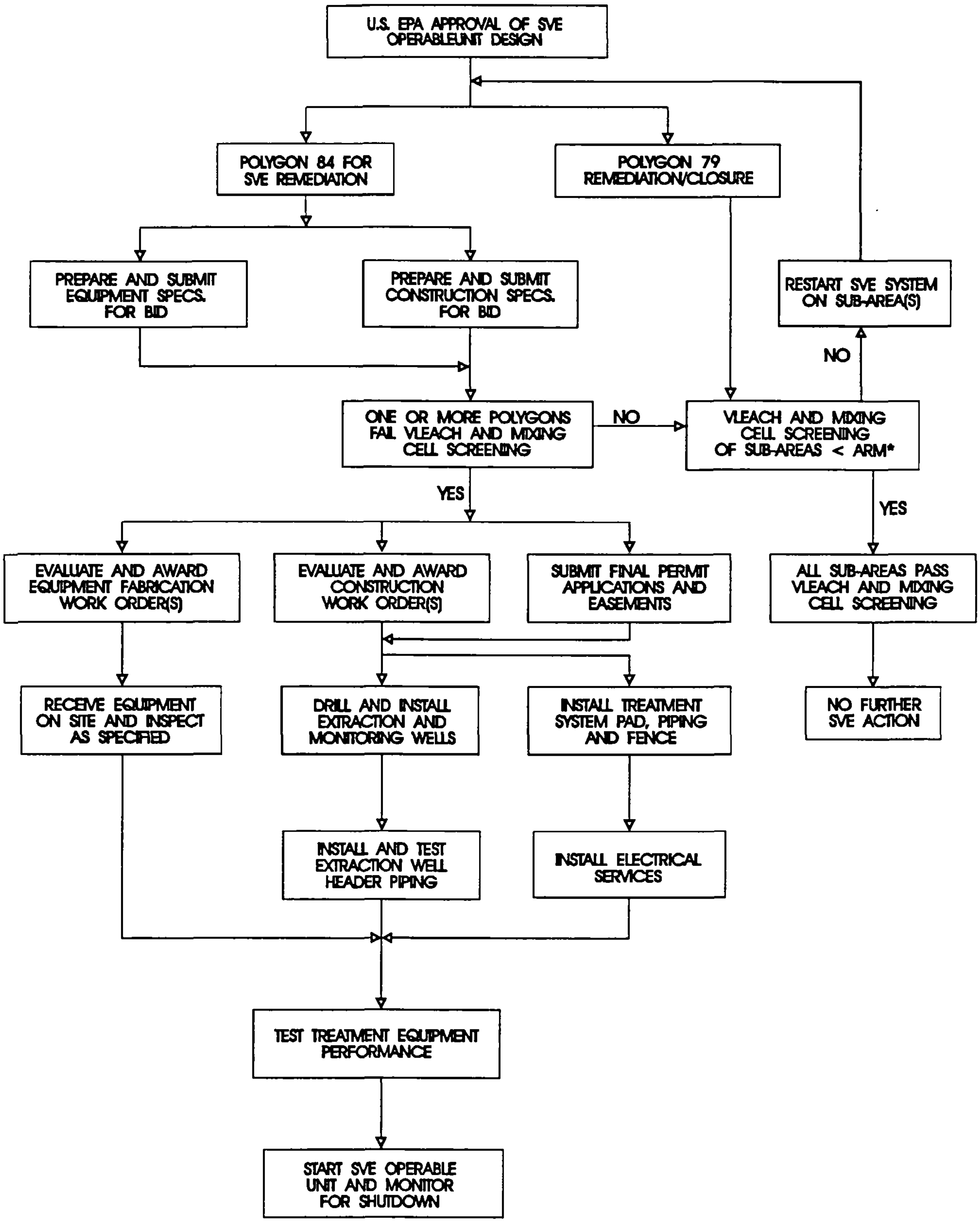


◇ = MILESTONE/DELIVERABLE

CONSTRUCTION WORK SCHEDULE

M&E Metcalf & Eddy

Drawn by: J. Weldmann	Job Number: 012014	Date: March 1994
Checked by: S. Zachary		Figure Number: 6-1



* ARM = ALLOWABLE RESIDUAL MASS FOR NO SVE REMEDY

** = FOR SIMULTANEOUS POLYGON 79/84 SVE TREATMENT

CONSTRUCTION WORK FLOW DIAGRAM

M&E Metcalf & Eddy

Drawn by: J. Weidmann	Job Number: 012014	Date: March 1994
Checked by: S. Zachary		Figure Number: 6-2

1994 Polygon 79 Final Closure Monitoring per Goodyear/U.S. EPA negotiations (letter to U.S. EPA dated November 1, 1993). If needed, the SVE unit will be used to treat both Polygon 79 and 84 simultaneously to comply with the conditions of the Polygon 79 O&M Manual and operational schedule.

SECTION SEVEN

REFERENCES

1. Soil Vapor Technical Memorandum, RI/FS, Phoenix-Goodyear Airport RI/FS, 2/27/87, U.S. EPA 30-9L19.0/W63600.FG.

2. Revised Estimate of Volatile Organic Contaminant Mass at the Phoenix-Goodyear Airport Superfund Site, July 19, 1989, prepared by HydroGeoChem, Inc.

3. Freeze, R.A., and J.A. Cherry, 1979. Ground Water. Prentice-Hall, Englewood Cliffs, New York.

4. Estimate of Volatile Organic Contaminant Mass at the Phoenix-Goodyear Airport Superfund Site, May 31, 1989.

5. Consent Decree, 1991, U.S. EPA, Phoenix-Goodyear Airport Superfund Site.

6. Record of Decision, Phoenix-Goodyear Airport Superfund Site, Sept. 1989, U.S. EPA 30-9L19.0/RDD63605.RA.

7. RI/FS Phoenix-Goodyear Airport, June 7, 1989, Vol. 6, Appendix S and T.

8. Maskarenic, M.P., L.H. Johnson, and S.K. Holladay. 1988. Recommendations for Holding Times of Environmental Samples. Proceedings of the U.S. EPA Symposium on Waste Testing and Quality Assurance, Vol. II, July 11-15, The Weston Hotel, Washington, D.C., pp H-29 - H-45.

9. Metcalf & Eddy, Inc. Soil Vapor Extraction Operable Unit Final Operations and Maintenance Manua, Phoenix-Goodyear Airport, Polygon 79, Goodyear, Arizona. November 5, 1993.

10. QA/QC Control Guidance for Removal Activities Sampling QA/QC Plan and Data Validation Procedures, U.S. EPA, April 1990. PB(90)-274481.

11. A Compendium of Superfund Field Operations Methods, U.S. EPA, Dec. 1987, PB88-181557.

12. Field Screening Methods Catalog - User's Guide, Sept. 1988, U.S. EPA, 540/2-88/005.

13. Sharp & Associates, Inc. November 1, 1993. Correspondence to U.S. EPA regarding Polygon Reprioritization and Polygon 84 Treatment.

14. Struttmann, T.J. and S.P. Zachary, 1993, Design of Soil Vapor Extraction systems Using Groundwater Flow Models. Proceedings of the Groundwater Modeling Conference, Golden, Colorado, June 9-11, 1993. International Groundwater Modeling Center at the Colorado School of Mines. Section 6, pp. 11-20.

15. Sharp and Associates, Inc., October 29, 1993, letter to U.S. EPA; Phoenix-Goodyear Airport; Soil Vapor Extraction Rebound initiation/verification definition.

16. Metcalf & Eddy, Inc., November 25, 1993, Soil Vapor Extraction (SVE) Final Remedy Consent Decree Final Extraction and Treatment System Design, Phoenix-Goodyear Airport (South) Superfund Site, Goodyear, Arizona.

17. Metcalf & Eddy, Inc., March 30, 1992, Soil Vapor Extraction (SVE) Final Remedy Consent Decree Design Memorandum and Work Plan, Phoenix-Goodyear Airport (South), Goodyear, Arizona.

APPENDIX A

SVE OPERABLE UNIT AND WELLS DRAFT PLANS AND SPECIFICATIONS

(POLYGON 79/84)

A. HALF-SIZE DRAWINGS INCLUDED

B. FULL-SIZE DRAWINGS (REAR POCKET)

Phoenix - Goodyear Airport Superfund Site

Soil Vapor Extraction Operable Unit Final Design - Polygon 84/79

Goodyear, Arizona

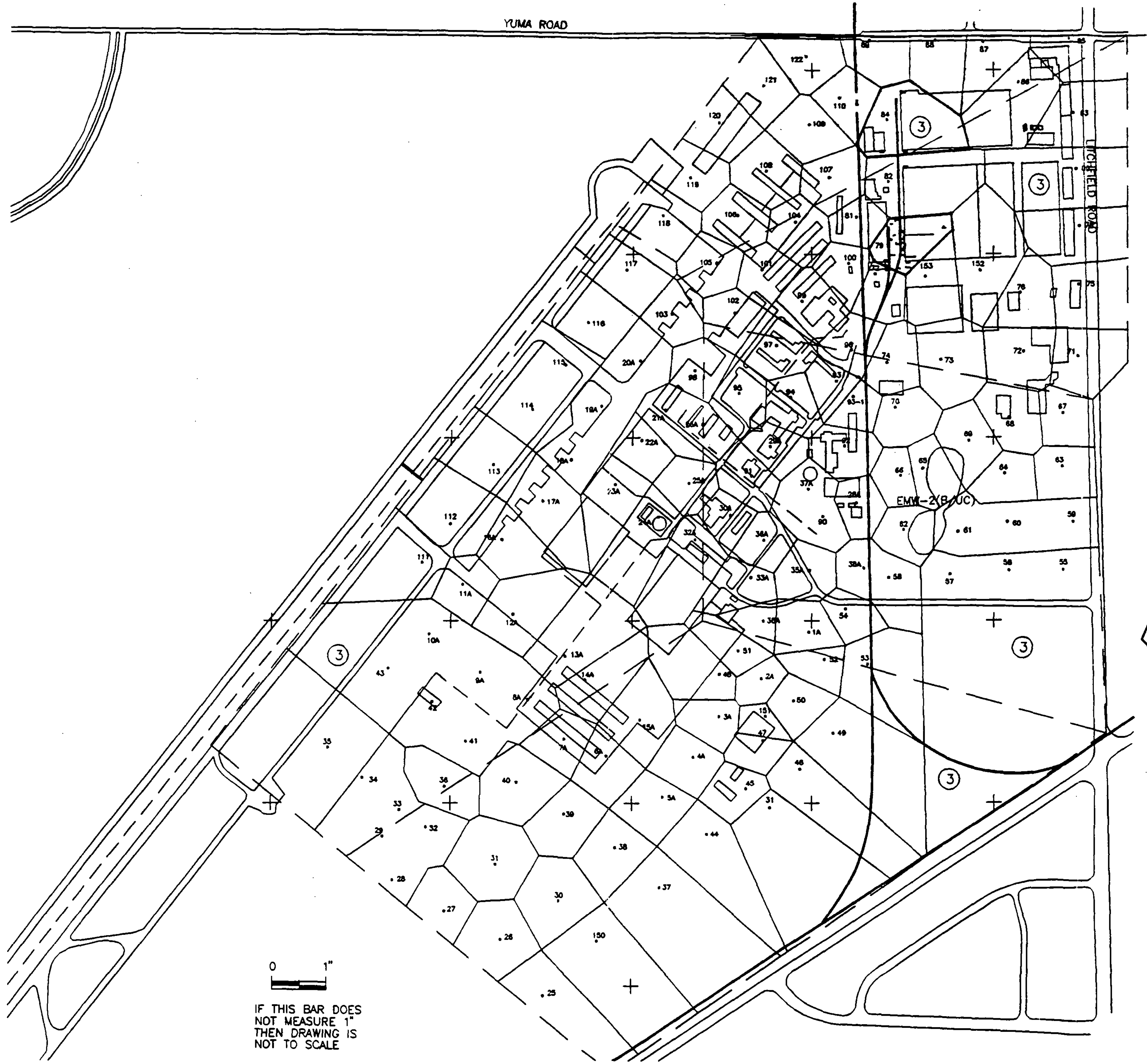
For:
Goodyear Tire and Rubber Company
Akron, Ohio

Draft: March 25, 1994 (Polygon 84)

LIST OF DRAWINGS

DRAWING NO.	DRAWING TITLE
	COVER SHEET
84-P-1	SITE MAP
84-C-1	POLYGON 79 LAYOUT
84-M-1	TREATMENT SYSTEM LAYOUT, PIPING AND WELL DETAILS
84-M-2	EXTRACTION WELLS AND PIPING DETAILS I
84-M-3	EXTRACTION WELLS AND PIPING DETAILS II
84-M-4	EXTRACTION WELLS AND PIPING DETAILS III
84-M-5	EXTRACTION WELLS AND PIPING DETAILS IV
84-M-6	EXTRACTION WELLS AND PIPING DETAILS V
84-M-7	EXTRACTION WELLS AND PIPING DETAILS VI
84-M-8	EXTRACTION WELLS AND PIPING DETAILS VII
84-M-9	EXTRACTION WELLS AND PIPING DETAILS VIII
84-E-1	ELECTRICAL AND INSTRUMENTATION SYMBOLS
84-E-2	PROCESS & INSTRUMENTATION DIAGRAM 1
84-E-3	PROCESS & INSTRUMENTATION DIAGRAM 2
84-E-4	ELECTRICAL ONE LINE AND INTERCONNECTION DIAGRAM
84-E-5	ELECTRICAL CONTROL WIRING DIAGRAM
84-E-6	ELECTRICAL CONTROL PANELS

M&E
Metcalf & Eddy



△ PHASE 1 SOIL GAS LOCATION

• SOIL GAS SURVEY LOCATIONS

AREA OF INFLUENCE FOR VERTICLE DISTRIBUTION DATA (1986/1987 RI/FS)

AREA OF INFLUENCE FOR SOIL GAS SURVEY DATA (POLYGON)

(4) REGION DELINEATION (1986/1987 RI/FS)

POLYGON TO UNDERGO SVE REMEDIATION – THIS DESIGN DOCUMENTATION

NO.	DATE	MADE BY	CHECKED	REVISION DESCRIPTION
1	5/19/93	SZ		REVISED SCALE & BASE MAP TO SURVEY
2	3/94	SZ		POLYGON 84 DESIGN

M&E METCALF & EDDY

DESIGNED LR/SZ
DRAWN
CHECKED

SCALE: 1"=300'

M&E SAN DIEGO DATE
CALIF. R.E. No.

PGA – Goodyear

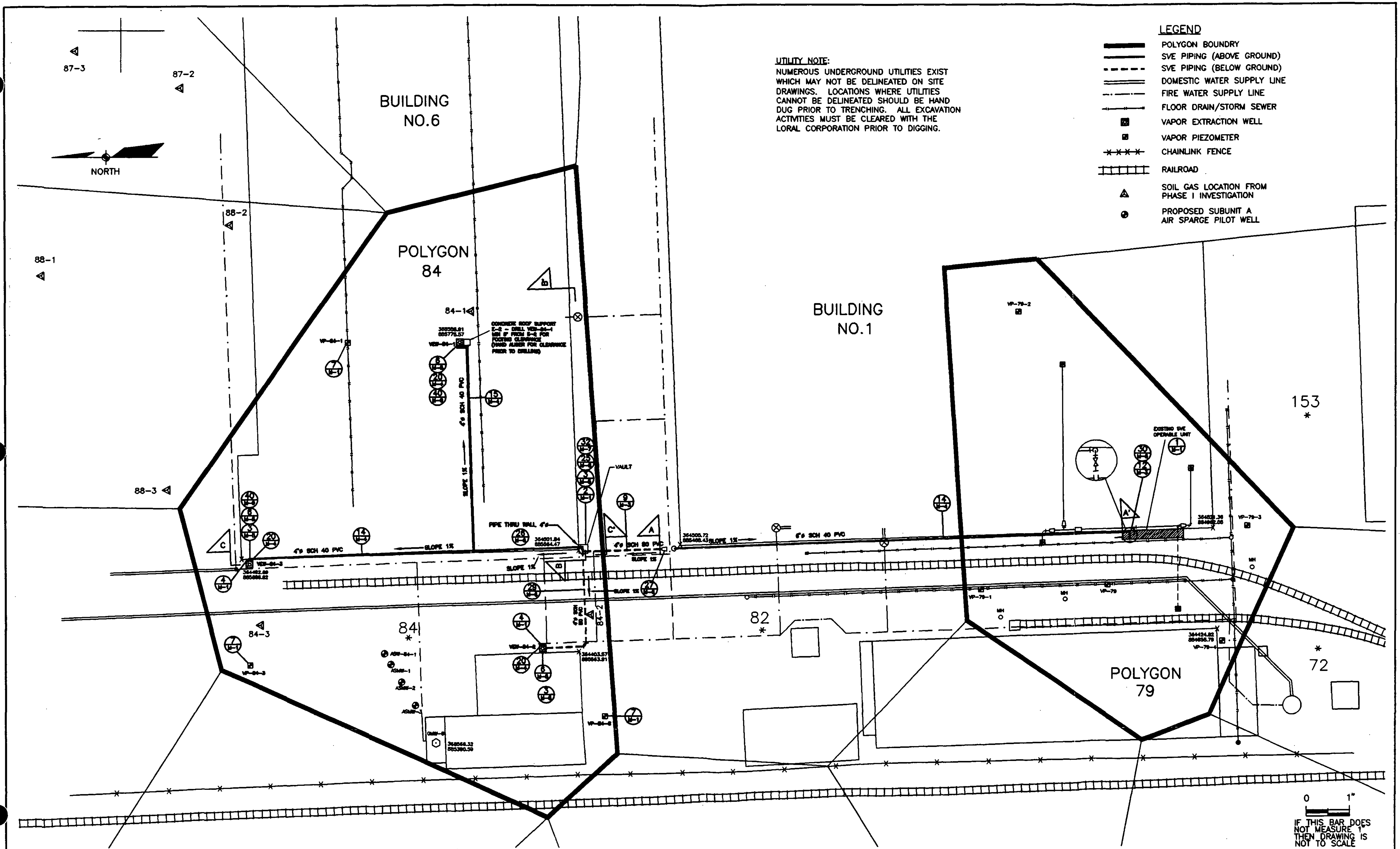
APPROVED DATE

SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN – POLYGON 84/79

FINAL SVE DESIGN
POLYGON SITE MAP

DRAWING NO. 84-P-1
SHEET 2
OF 18 SHEETS

OXT84P-1



NUMBER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION
1	5/19/93	SZ		REVISED SCALE & BASE MAP TO SURVEY
2	2/94	LR/SZ		POLYGON 84 SVE DESIGN

GY84C-1

M&E METCALF & EDDY

DESIGNED LR
DRAWN
CHECKED

SCALE: 1" = 40'

SAN DIEGO 1994 DATE
CALIF. R.E. No.

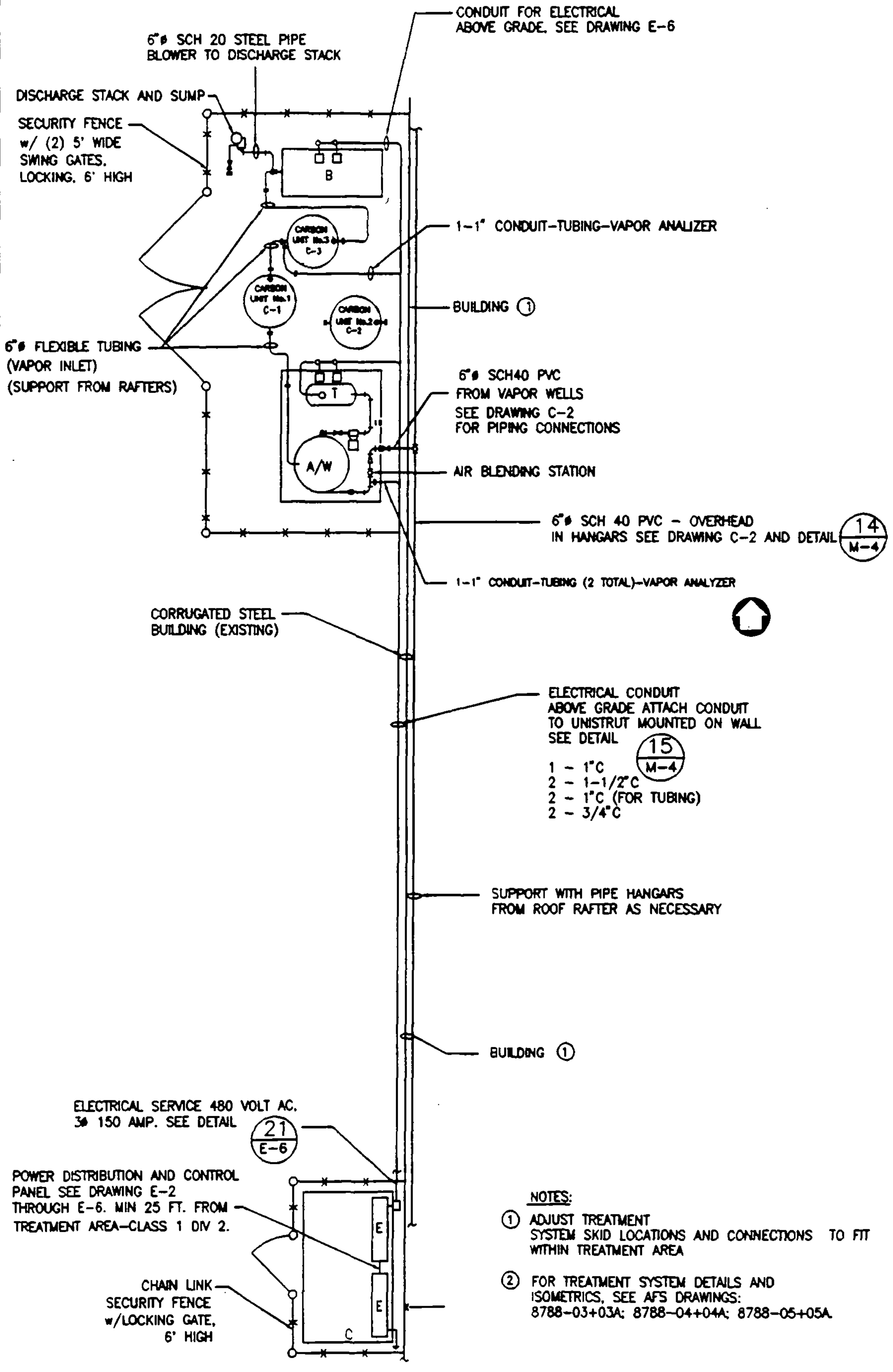
PGA – Goodyear

APPROVED DATE

SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN – POLYGON 84/79

FINAL SVE DESIGN
POLYGON SITE MAP

DRAWING NO. 84-C-1
SHEET 3 OF 18 SHEETS



NOTES:

① ADJUST TREATMENT SYSTEM SKID LOCATIONS AND CONNECTIONS TO FIT WITHIN TREATMENT AREA

② FOR TREATMENT SYSTEM DETAILS AND ISOMETRICS, SEE AFS DRAWINGS: 8788-03+03A; 8788-04+04A; 8788-05+05A.

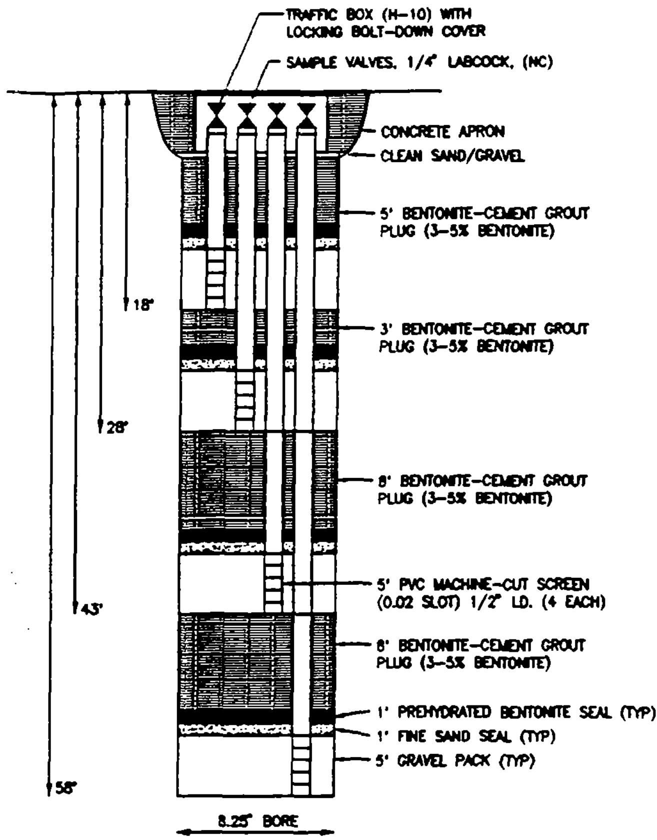
TREATMENT PLANT DETAIL ①

NOTES:

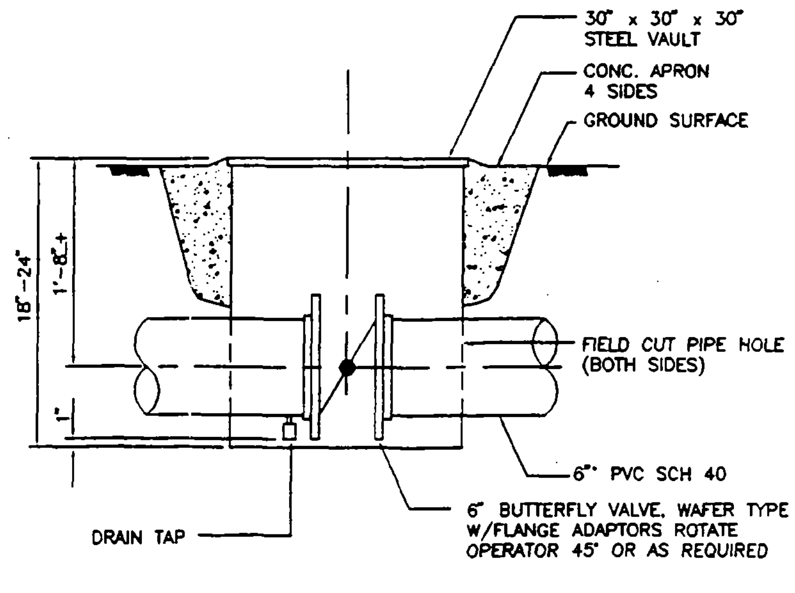
1. REFER TO AFS DRAWINGS 8788-03, 03A, 8788-05, 8788-04, 04A FOR TREATMENT SYSTEM CONFIGURATION DETAILS.
2. ALL PIPING ON SKIDS #1 AND #2 TO BE 6"ø CARBON STEEL
3. ALL PIPING BETWEEN SKIDS OR WELL HEADERS TO BE SCHEDULE 80 PVC (6"ø) UNLESS OTHERWISE NOTED.
4. ELECTRICAL PANEL LOCATED OUTSIDE CLASS I DIV 2 AREA.
5. PIPING CONNECTIONS BETWEEN SKID #1 TO C-1, C-1 TO C-2, AND C-2 TO B TO BE 6"ø FLEXIBLE SPIRALITE HOSE W/ALUMINUM CAMLOCK FITTINGS
6. FENCE AROUND TREATMENT COMPOUND TO BE 6' HIGH. WITH SAFETY/SECURITY PLACARDS.

LEGEND

A/W= AIR/WATER SEPARATOR
B = BLOWER
C = CONCRETE PAD
C-1 =CARBON VESSEL
T = WATER TANK
P = PUMP
E = ELECTRICAL PAD

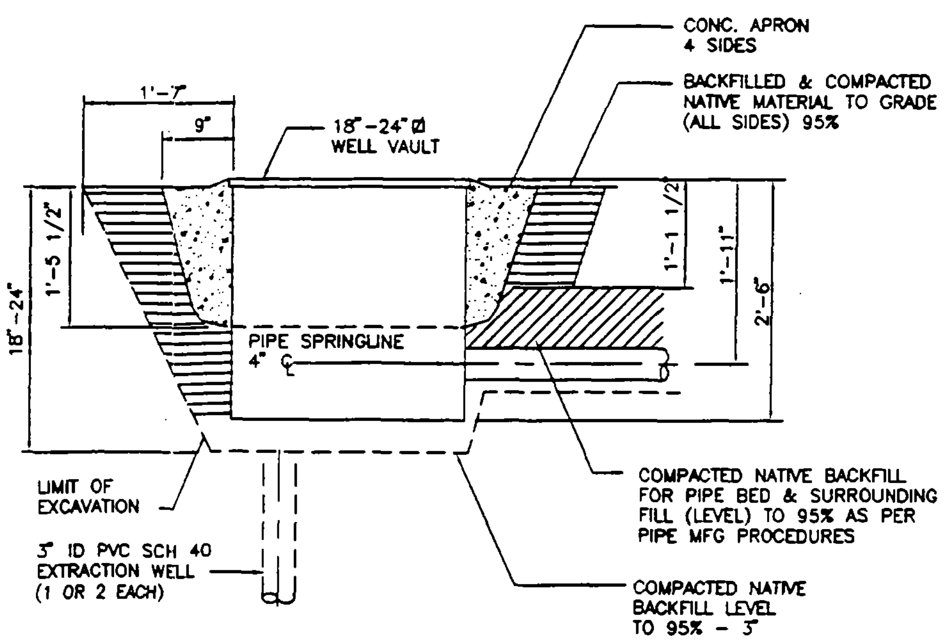


SOIL VAPOR MONITORING WELL DETAIL ⑦
SCALE: NONE (CLUSTER CONSTRUCTION)



NOTE:
BACKFILL REQUIREMENTS SIMILAR TO EXTRACTION WELL VAULT

VALVE VAULT DETAIL ②
SCALE: NONE



VAULT INSTALLATION DETAIL ④
SCALE: NONE

NUMBER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION
1	3-22-93	IB		ELEC. PER MFG. CHANGE + WELL RELOCATION
2	10-93	SZ		FIELD AS-BUILT
3	2-94	SZ		POLYGON 84 DESIGN

M&E METCALF & EDDY

DESIGNED
DRAWN
CHECKED

SCALE: NONE

MAP SAN DIEGO, CA 1994 DATE
CALIF. R.E. No.

PGA - Goodyear

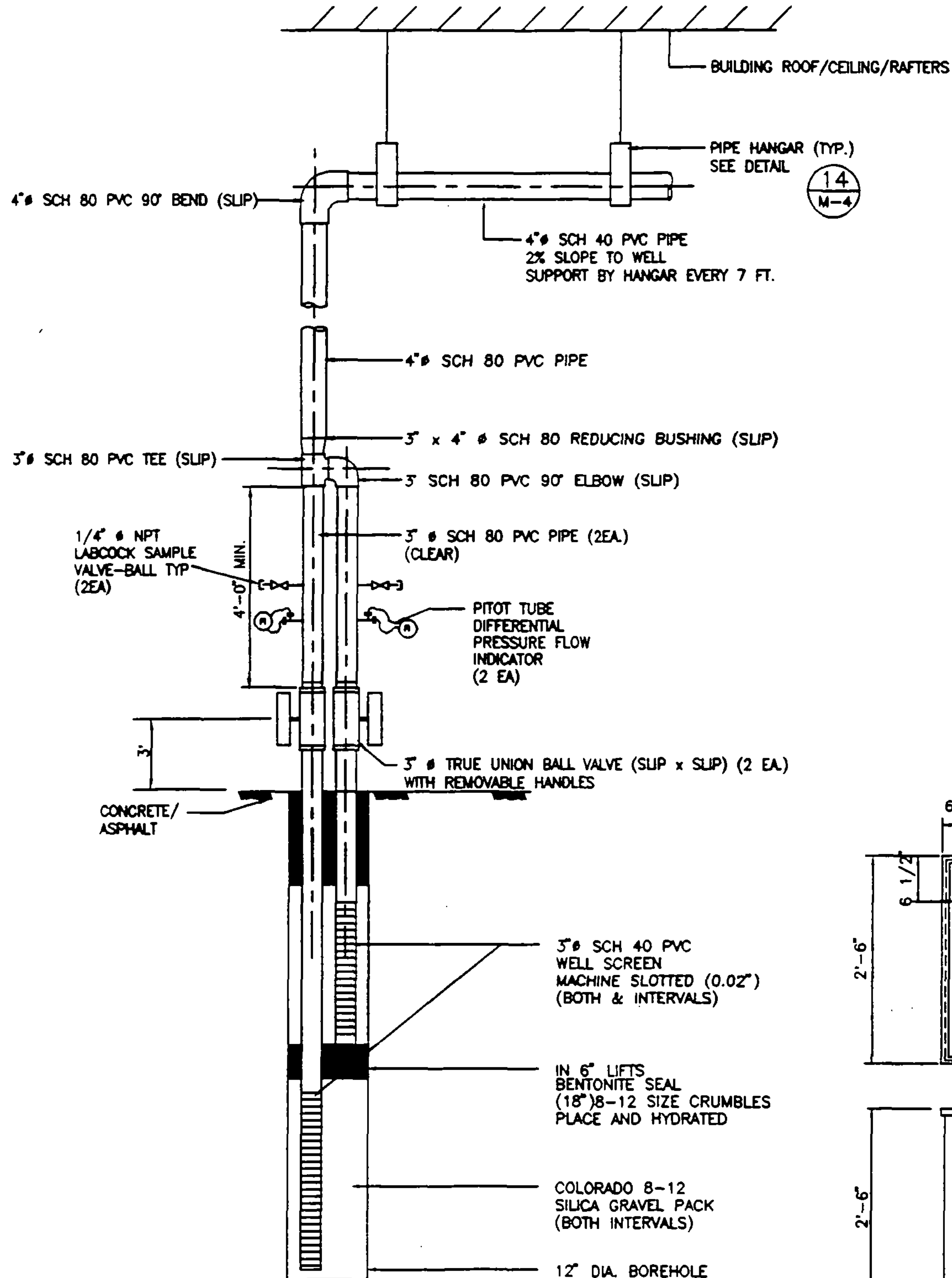
APPROVED DATE

SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN - POLYGON 84/79

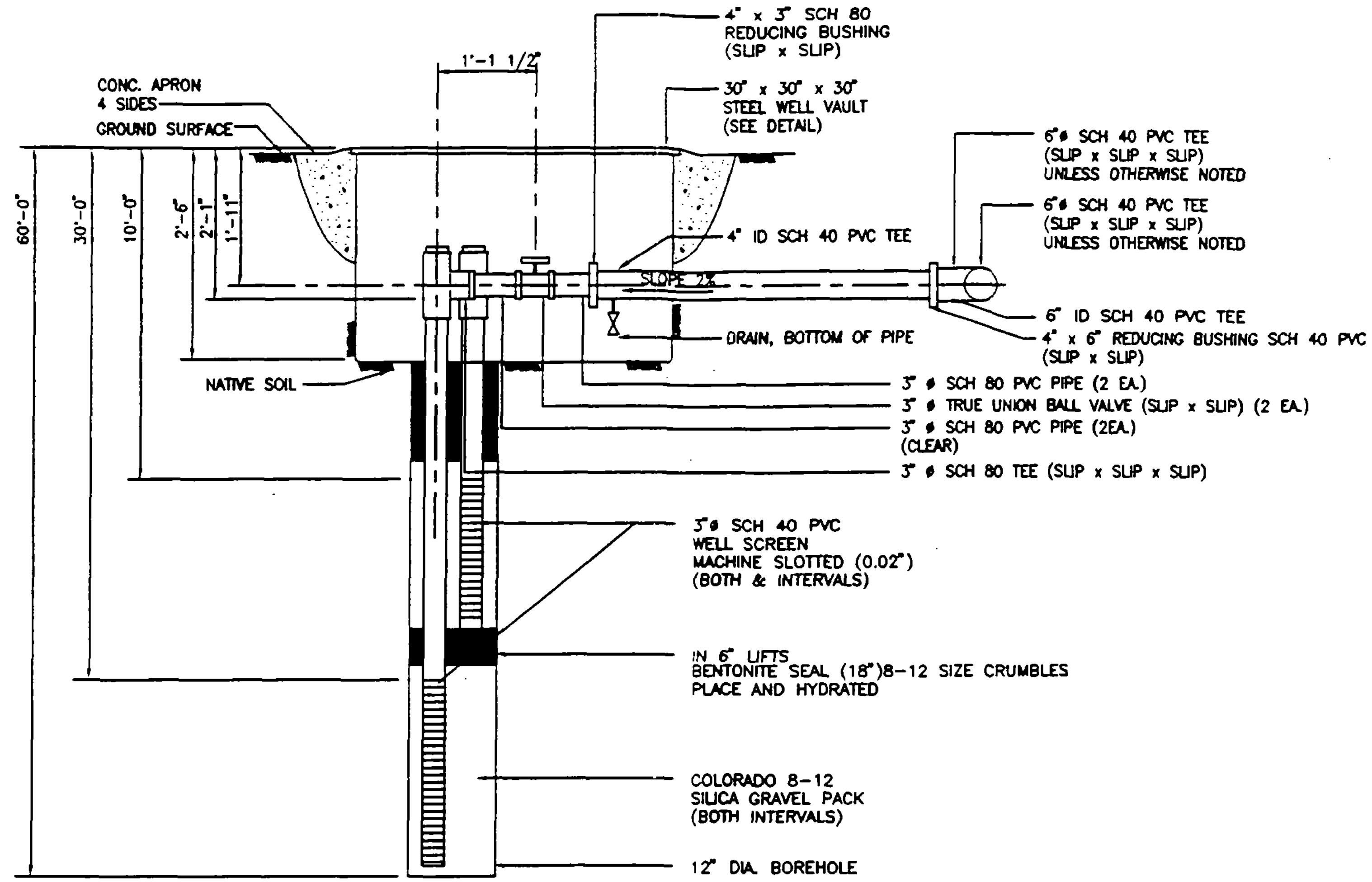
TREATMENT SYSTEM LAYOUT
PIPING AND WELL DETAILS

DRAWING NO: 84-M-1
SHEET: 4
OF 18 SHEETS

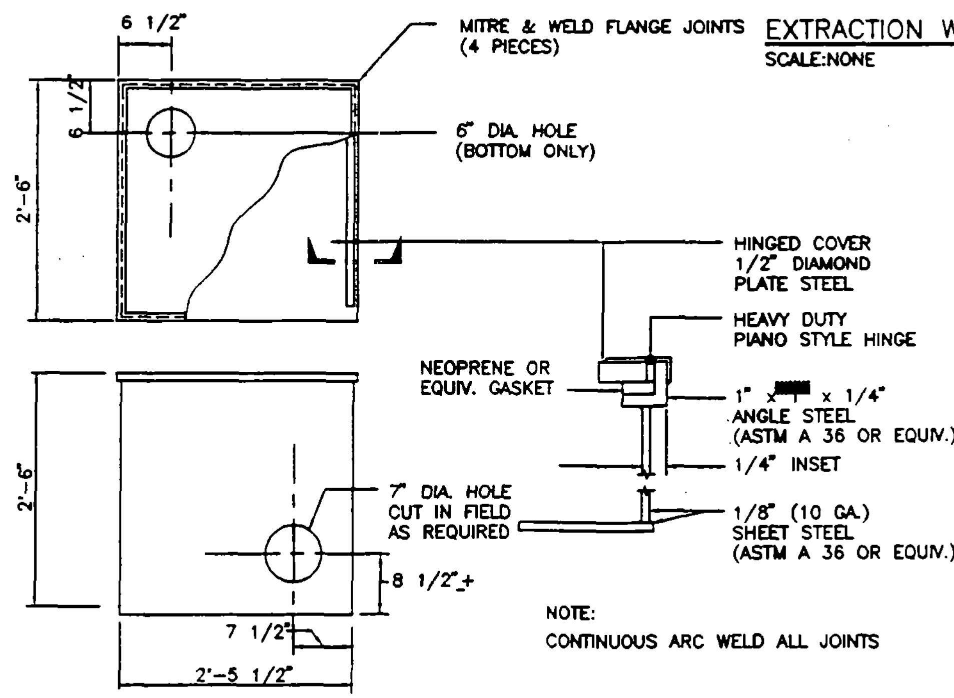
GYT84M-1



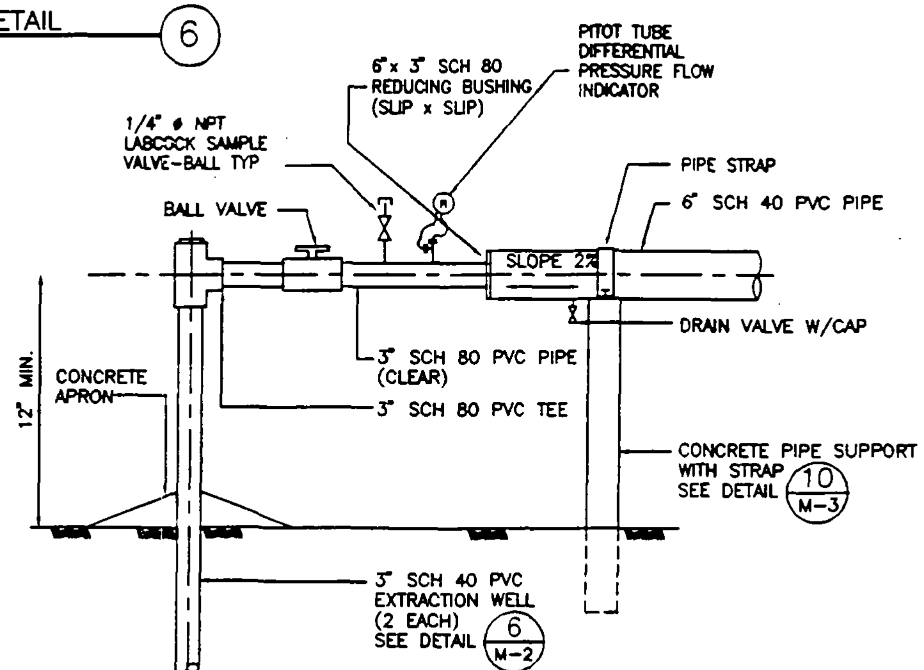
EXTRACTION WELL DETAIL (5)
SCALE:NONE



EXTRACTION WELL DETAIL (6)
SCALE:NONE



STEEL ROADWAY VAULT DETAIL (3)
SCALE:NONE



EXTRACTION WELL CONNECTION ABOVE GROUND DETAIL (11)
SCALE:NONE

NUMBER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION
1	10-93	SZ		FIELD AS-BUILT

METCALF & EDDY

DESIGNED ____ DRAWN ____ CHECKED ____

SCALE: NONE

CALIF. R.E. No. ____ DATE

PGA - Goodyear

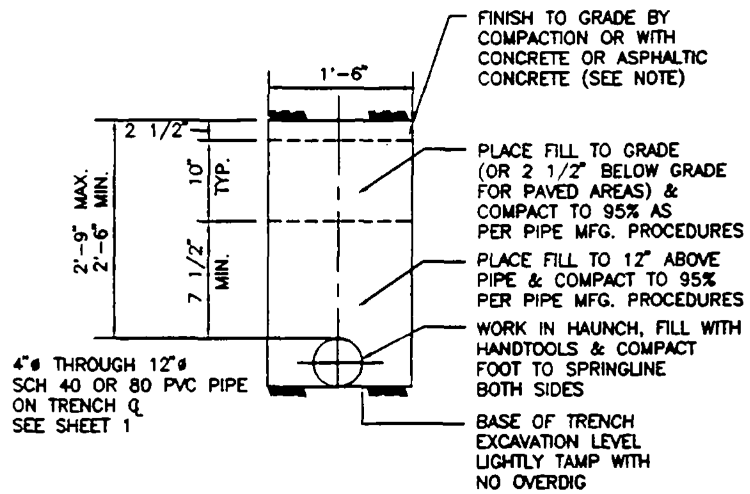
APPROVED ____ DATE

SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN - POLYGON 84/79

EXTRACTION WELLS AND
PIPING DETAILS I

DRAWING NO: 84-M-2
SHEET 5
of 18 SHEETS

GYT84M-2



NOTES:

1. ALL TRENCHES NOT REQUIRING ASPHALT CUTTING WILL BE COMPLETED WITH COMPACTED FILL.

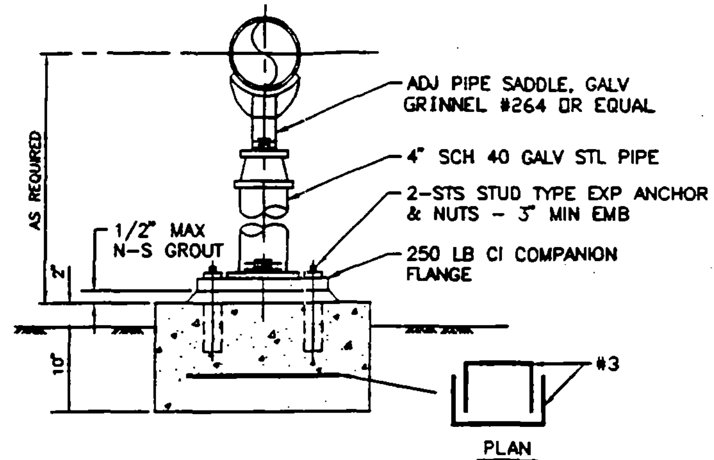
2. TRENCHES REQUIRING CONCRETE OR ASPHALTIC CONCRET WILL USE THE FOLLOWING:

   A – ASPHALTIC CONCRETE:
   MINERAL AGGREGATE & ASPHALT BINDER, PENETRATION AR4000, AGGREGATE TYPE B, 1/2" MAX., MEDIUM GRADING, CONFORM WITH CALTRANS SEC 29.

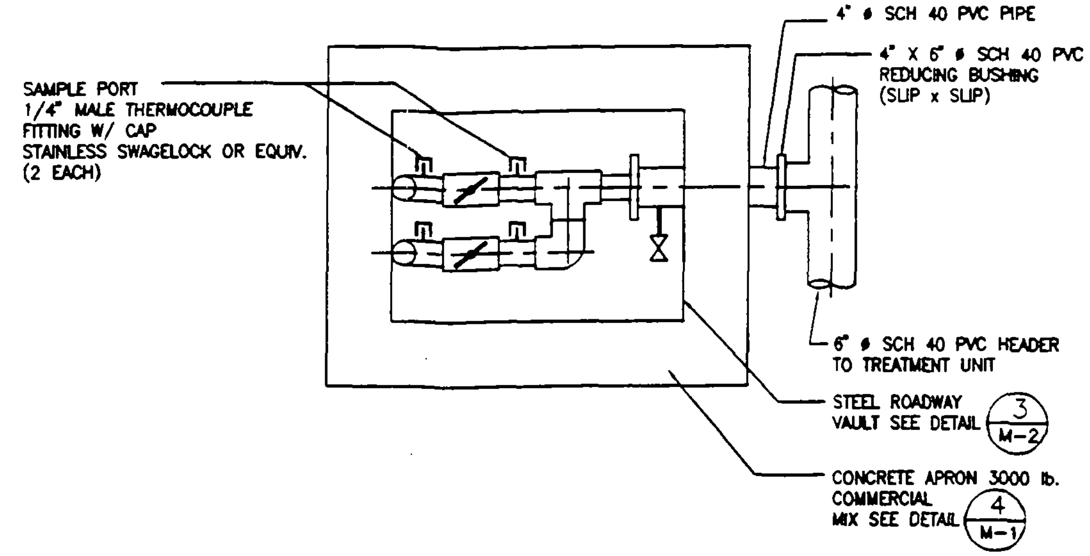
   B – CONCRETE:
   3000 PSI COMMERCIAL W/NO ADDITIVES.

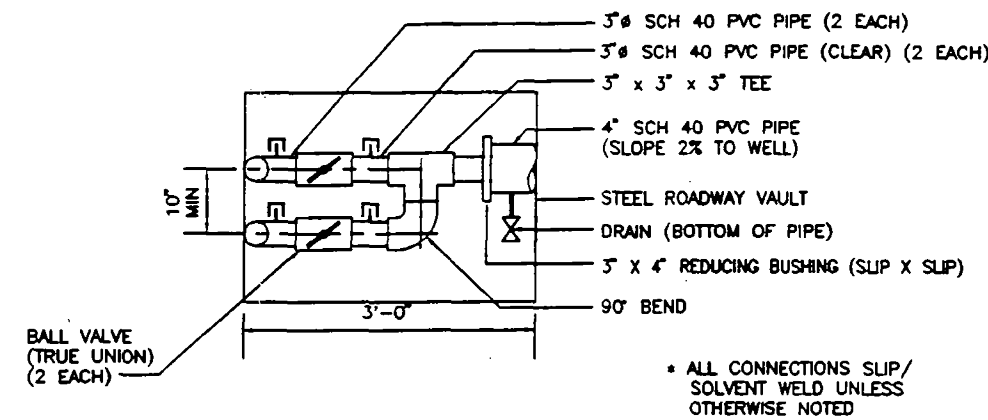
3. ALL PIPING TO SLOPE TO WELL OR VALVE BOXES.

TYPICAL TRENCH SECTION DETAIL (9)
SCALE:NONE



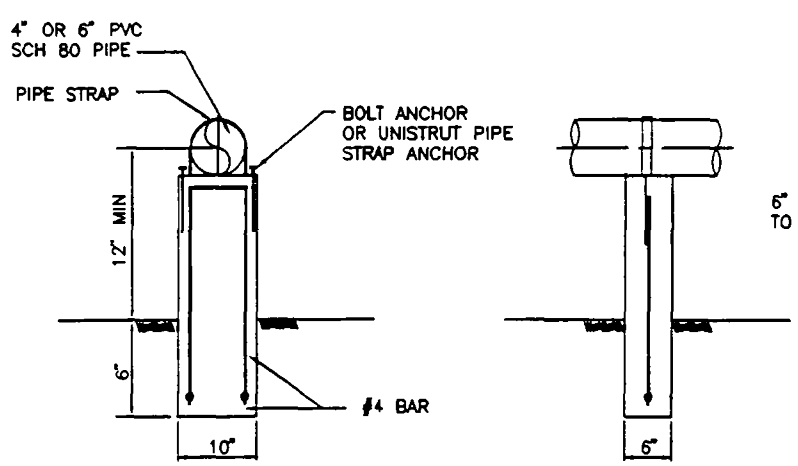
PIPE SUPPORT DETAIL (18)
SCALE: NONE



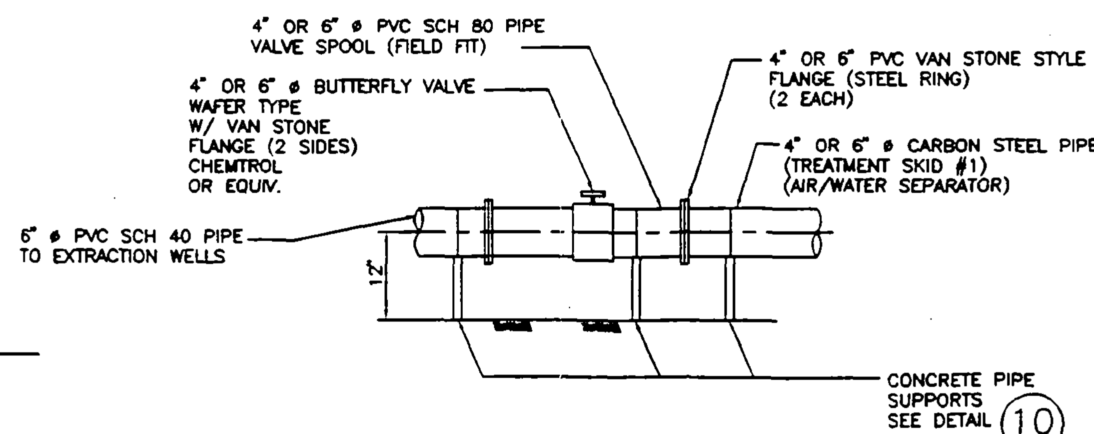


* ALL CONNECTIONS SLIP/ SOLVENT WELD UNLESS OTHERWISE NOTED

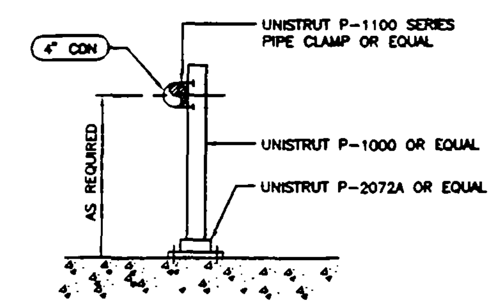
DUAL EXTRACTION WELL VAULT DETAIL (8)
SCALE:NONE



PIPE SUPPORT DETAIL (10)
SCALE:NONE



TREATMENT PLANT CONNECTION DETAIL (12)
SCALE:NONE



PIPE SUPPORT (13)
SCALE: 3/4"=1'-0"

GYT84M-3

NUMBER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION

M&E METCALF & EDDY

DESIGNED L.R.
DRAWN
CHECKED
SCALE: NONE
SAN DIEGO
DATE
CALIF. R.E. No.

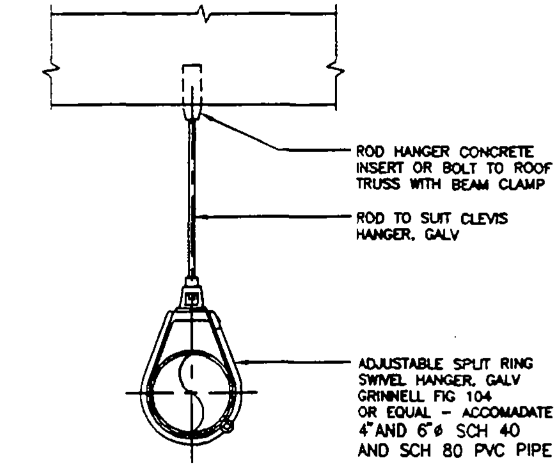
PGA – Goodyear

APPROVED DATE

SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN – POLYGON 84/79

EXTRACTION WELLS AND PIPING DETAILS II

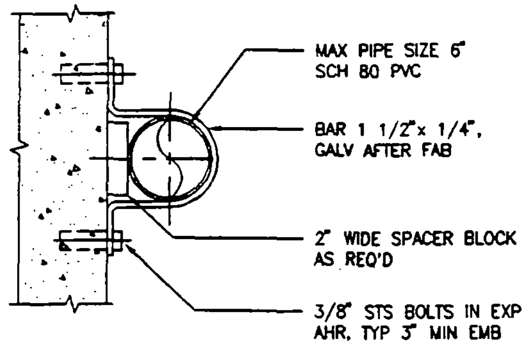
DRAWING NO: 84-M-3
SHEET 6 OF 18 SHEETS



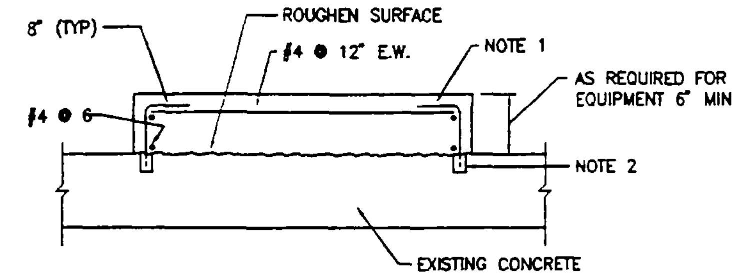
NOTE:

SUPPORT SPAN 6" DIA SCH 80 PVC = 12 FT
6" DIA SCH 40 PVC = 9 FT
4" DIA SCH 80 PVC = 10 FT
4" DIA SCH 40 PVC = 7 FT

PIPE HANGER (14)
SCALE: NONE



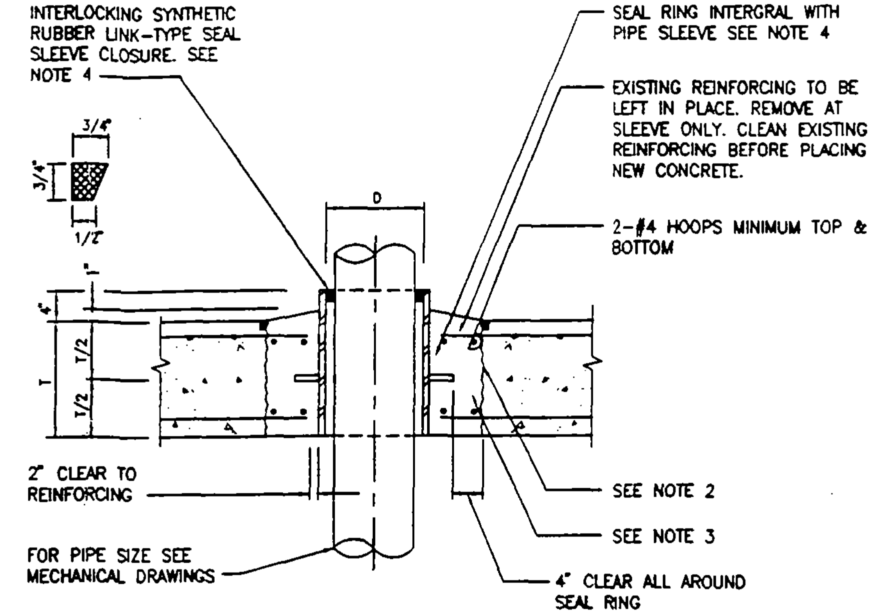
PIPE SUPPORT (15)
SCALE: NONE



NOTES:

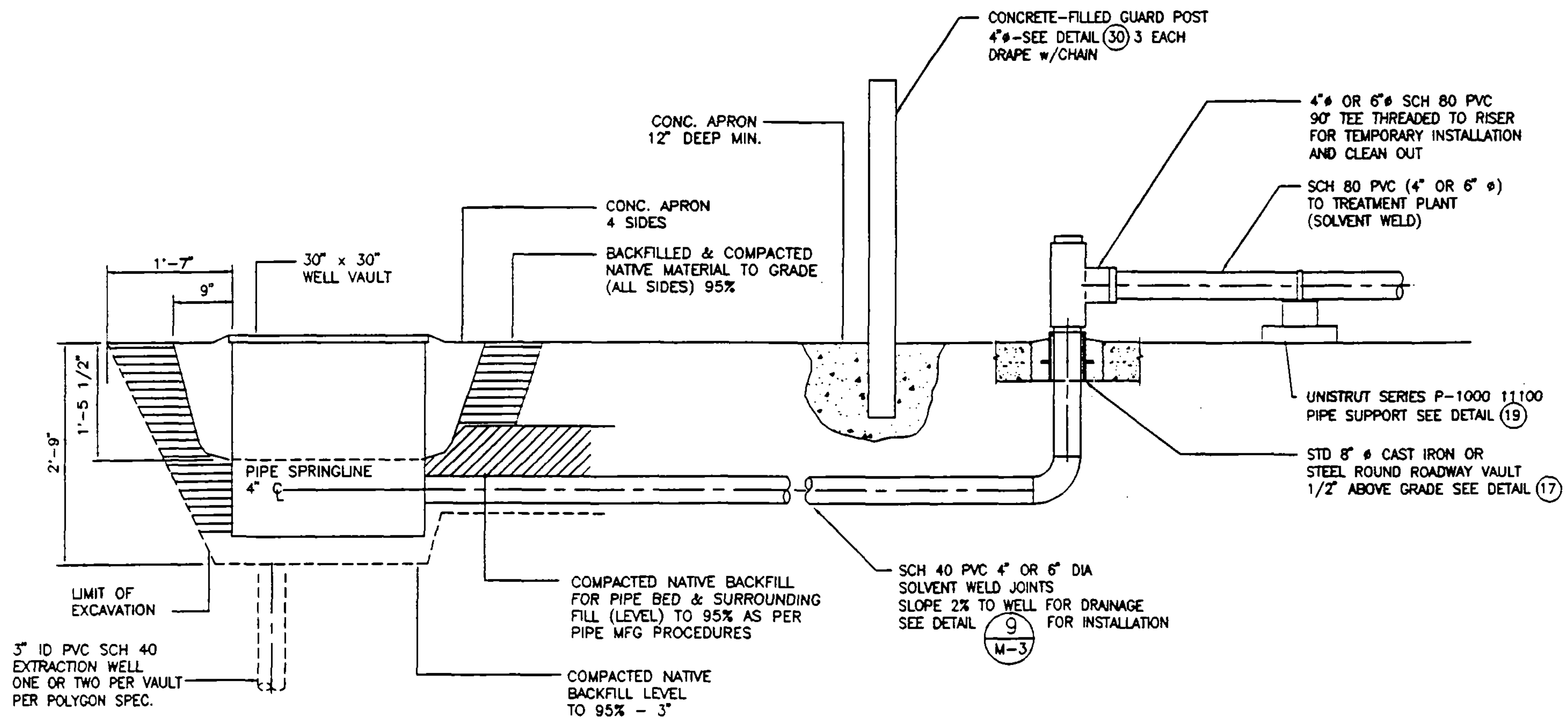
1. 1/2" ø ROD THREADED ONE END AT 12 INCHES O.C. MIN OR AS SIZED ON THE STRUCTURAL SHHETS.
2. AT EACH VERTICAL ROD PROVIDE STAR SLUGIN (2-UNIT THREADED SET FOR 1/2"ø ROD OR 3-UNIT THREADED SET FOR 5/8"ø ROD AND LARGER) COMPOUNDED ANCHOR OR AN ACCEPTABLE EQUIVALENT ACHOR.
3. EQUIPMENT ANCHORS TO BE SET WITH MIN 3" EMB PATTERN BY MFG.

CONCRETE PEDESTAL (16)
SCALE:NONE

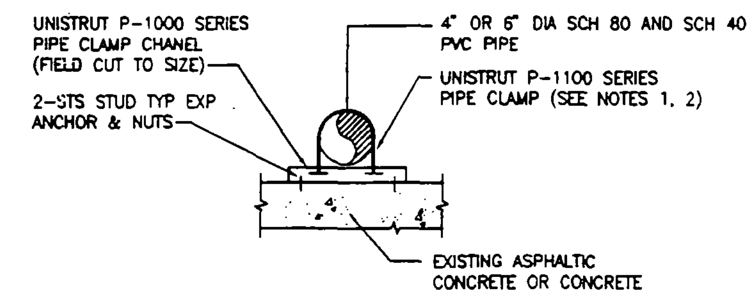


1. THE USE OF HEAVEY-DUTY PNEUMATIC HAMMERS ARE NOT PERMITTED TO REMOVE EXISTING CONCRETE FOR NEW PIPE OPENING.
2. APPLY BONDING AGENT TO ROUGHENED PREPARED CONCRETE SURFACE IN ACCORDANCE WITH MANUFACTURER'S PRINTED INSTRUCTIONS. BONDING AGENT TO BE. LARSEN WELD-CRETE AS MANUFACTURED BY LARSON PRODUCTS CORPORATION OF ROCHVILLE, MARYLAND OR AN ACCEPTABLE EQUIVALENT PRODUCT.
3. AFTER PIPE SLEEVE IS SET, FILL PENETRATION WITH CONCRETE HAVING A MINIMUM COMPRESSIVE STRENGTH OF 4000 LBS. PER SQ INCH AT THE END OF 28 DAYS
4. FOR FLOOR SLEEVES WHERE GASTIGHT OR WATERTIGHT SEALS ARE NOT REQUIRED, THE SEAL MAY BE OMITTED, WHERE IT IS REQUIRED SEE MANUFACTURER'S RECOMMENDATIONS FOR DIAMETER OF PIPE SLEEVE. FOR FLUSH MOUNT APPLICATIONS, USE ROADWAY VAULT 8" DIA. DIVERSIFIED WELL PRODUCTS OR EQUIVALENT.
5. WHEN SEAL IS OMITTED, PACK AND SEAL WITH JOINT COMPOUND SEE NOTE 4.

WALL SLEEVE (17)
SCALE: NONE



WELL HEADER CONSTRUCTION DETAIL (20)
SCALE:NONE



NOTE:

1. DIMENSIONS AND UNISTRUT PART NUMBERS TYPICAL FOR ALL SUPPORTS UNLESS OTHERWISE INDICATED
2. SUPPORT SPAN 6" DIA SCH 80 PVC = 12 FT
6" DIA SCH 40 PVC = 9 FT
4" DIA SCH 80 PVC = 10 FT
4" DIA SCH 40 PVC = 7 FT

PIPE ANCHOR DETAIL (19)
SCALE: NONE

NUMBER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION
1	2-94	SZ		POLYGON 84 DESIGN

M&E METCALF & EDDY

DESIGNED ______ DRAWN ______ CHECKED ______

SCALE: NONE

M&E SAN DIEGO, CA 1994 DATE
CALIF. R.E. No. ______

PGA - Goodyear

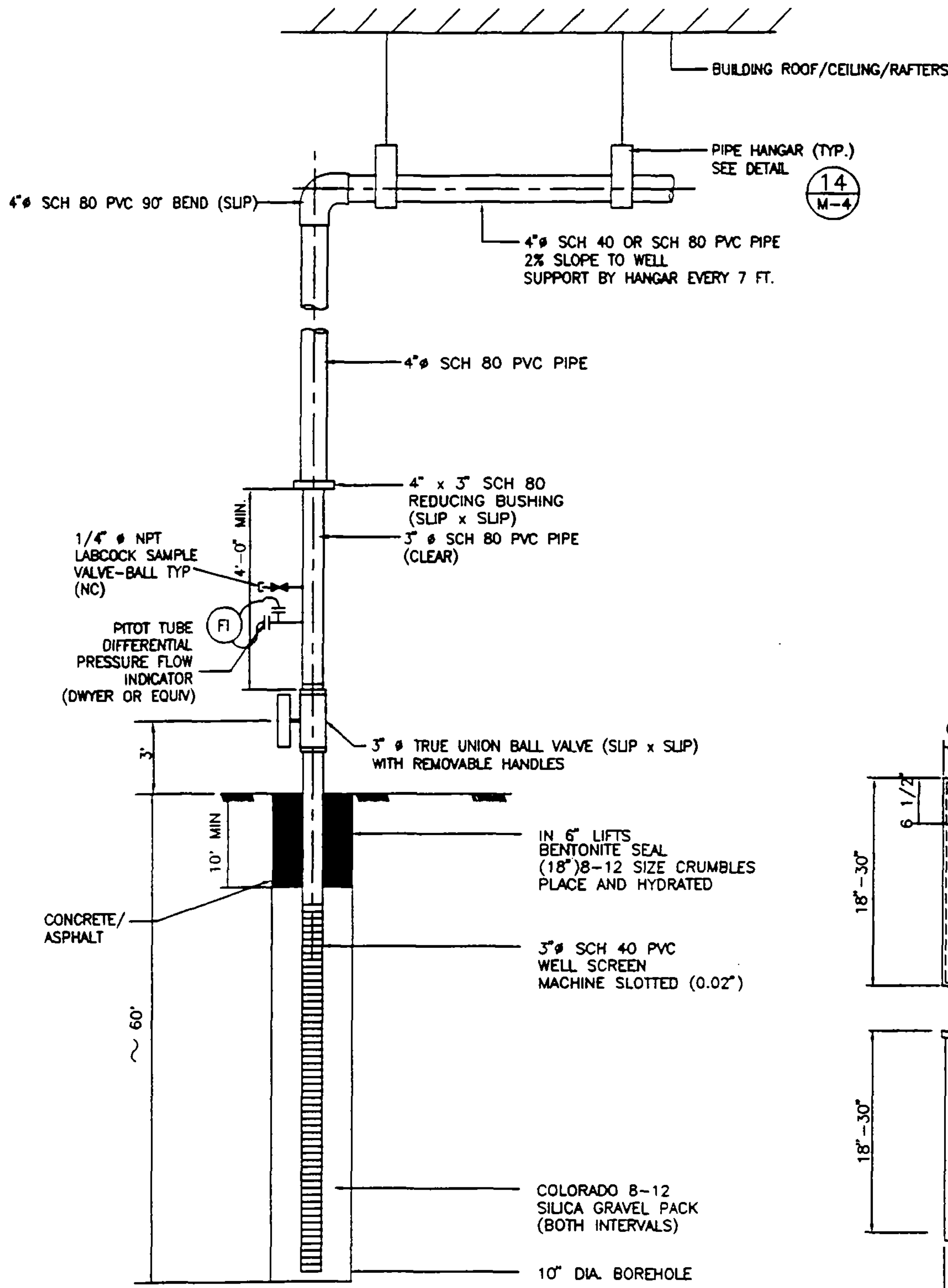
APPROVED ______ DATE

SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN - POLYGON 84/79

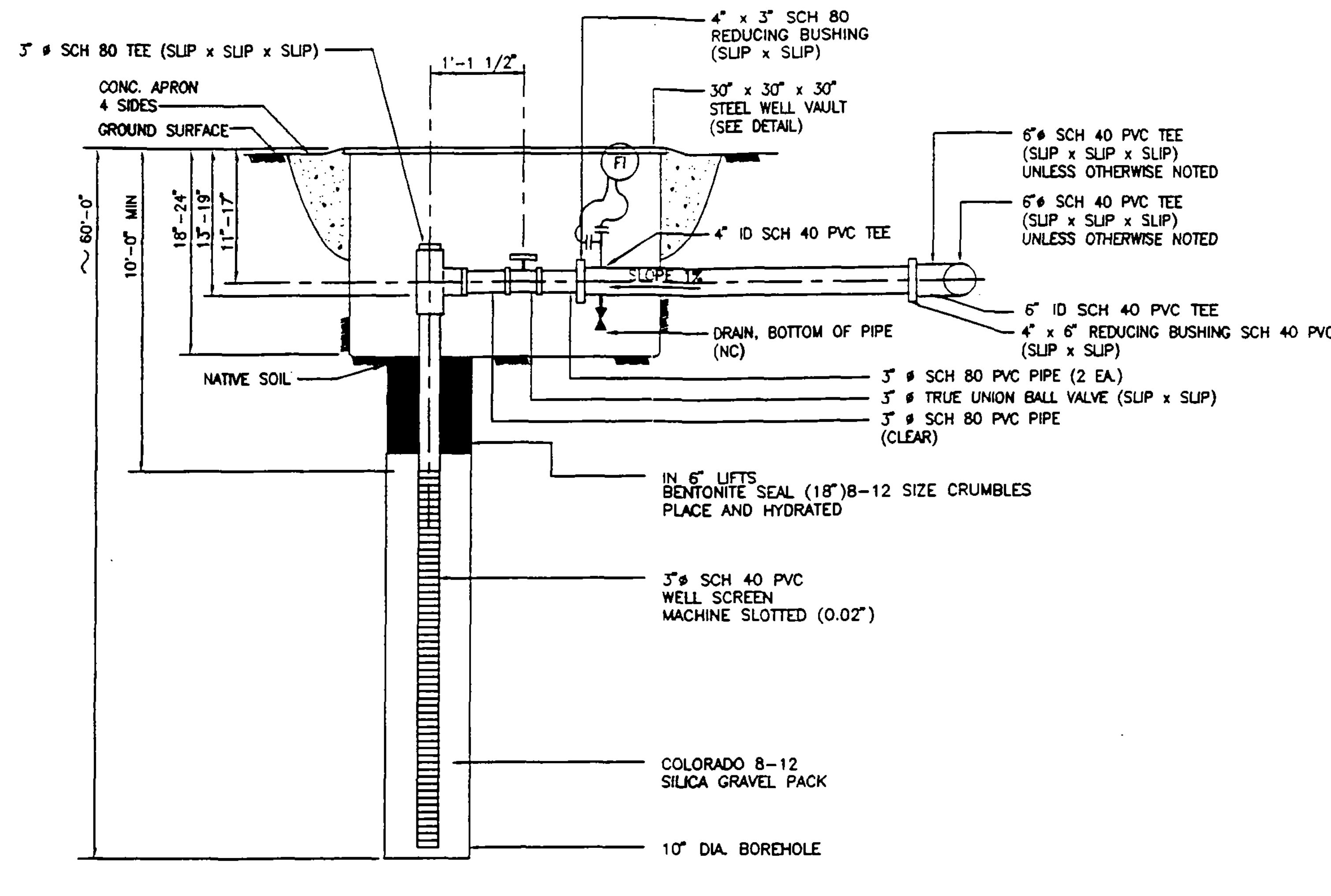
EXTRACTION WELLS AND PIPING DETAILS III

DRAWING NO: 84-M-4
SHEET: 7 OF 18 SHEETS

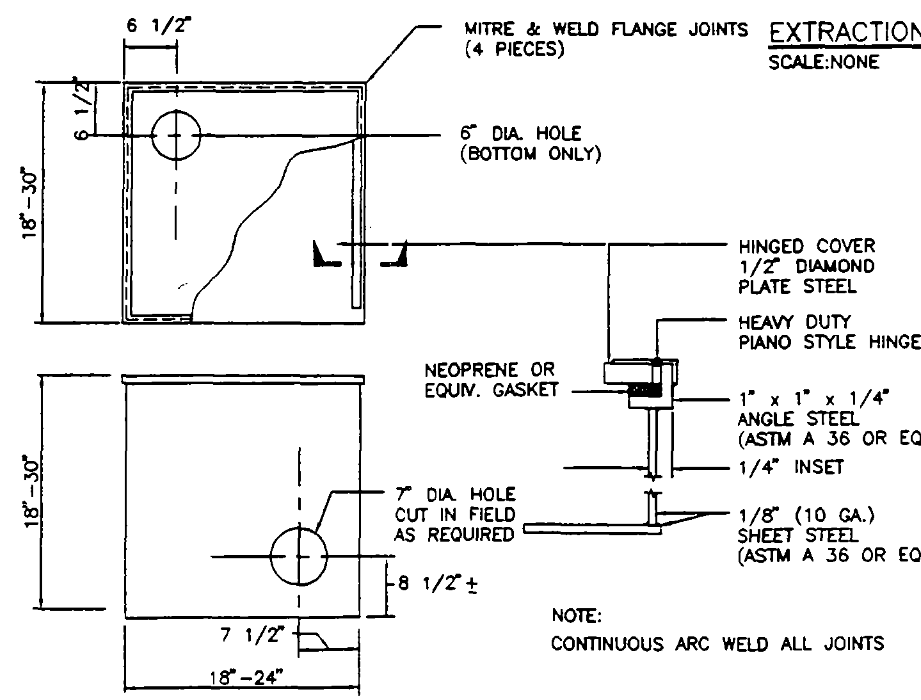
GYTB4M-4



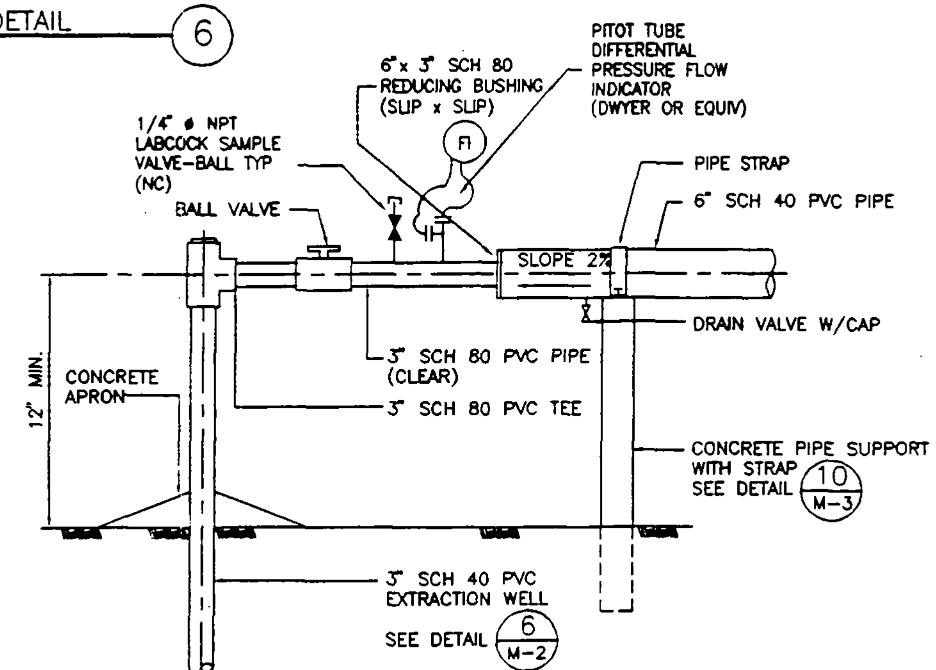
EXTRACTION WELL DETAIL 5
SCALE:NONE



EXTRACTION WELL DETAIL 6
SCALE:NONE



STEEL ROADWAY VAULT DETAIL 3
SCALE:NONE



EXTRACTION WELL CONNECTION ABOVE GROUND DETAIL 11
SCALE:NONE

NUMBER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION
1	10-93	SPZ		FIELD AS-BUILT
2	2-94	SPZ		POLYGON 84 DESIGN

M&E METCALF & EDDY

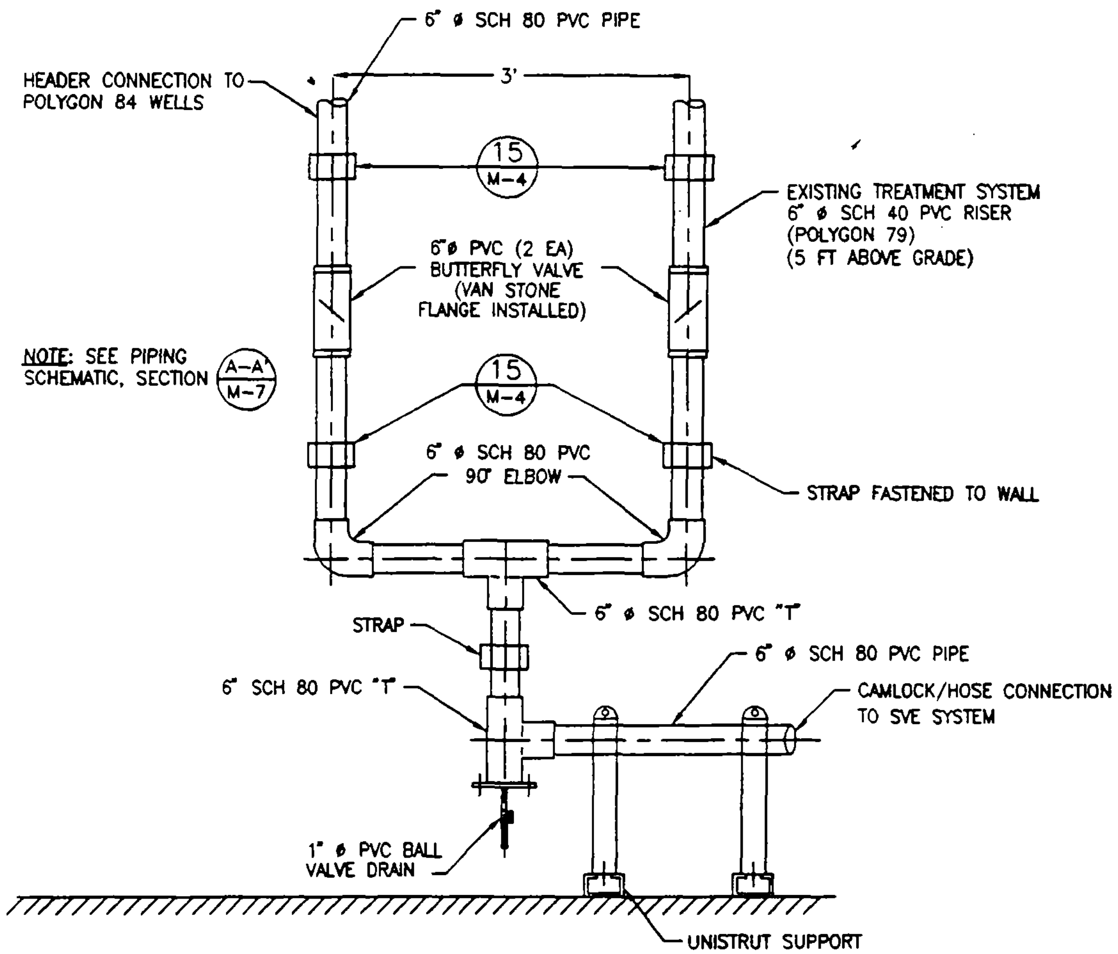
DESIGNED L.R.
DRAWN
CHECKED
SCALE: NONE
SAN DIEGO 1994 DATE
CALIF. R.E. No.

PGA – Goodyear
APPROVED DATE

SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN – POLYGON 84/79
EXTRACTION WELLS AND PIPING DETAILS IV

DRAWING NO: 84-M-5
SHEET: 8 OF 18 SHEETS

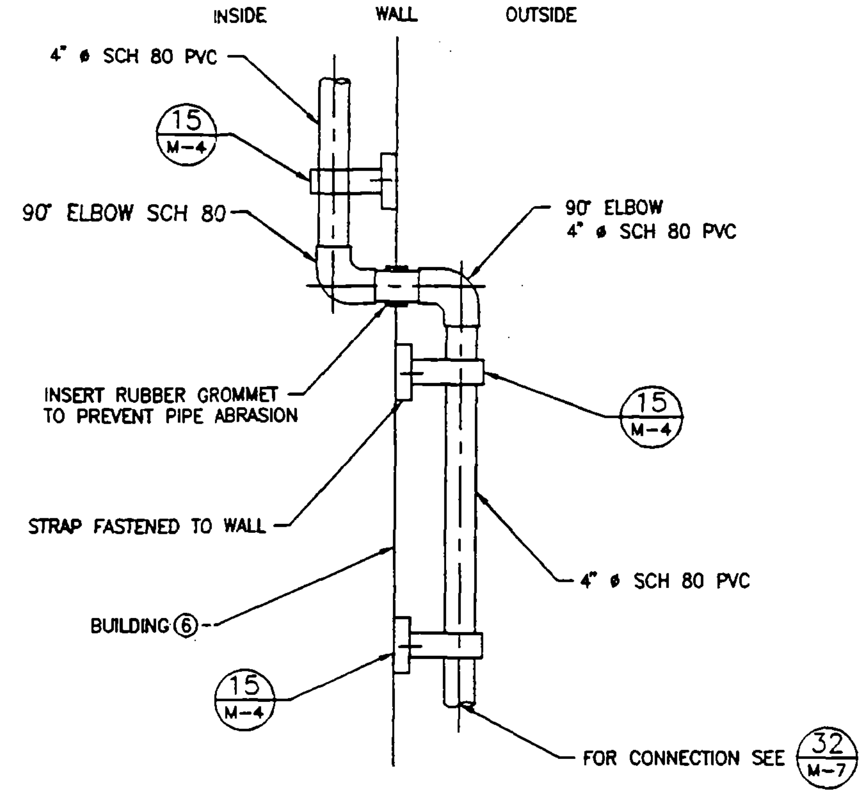
GYT84M-5



HEADER CONNECTION TO TREATMENT SYSTEM

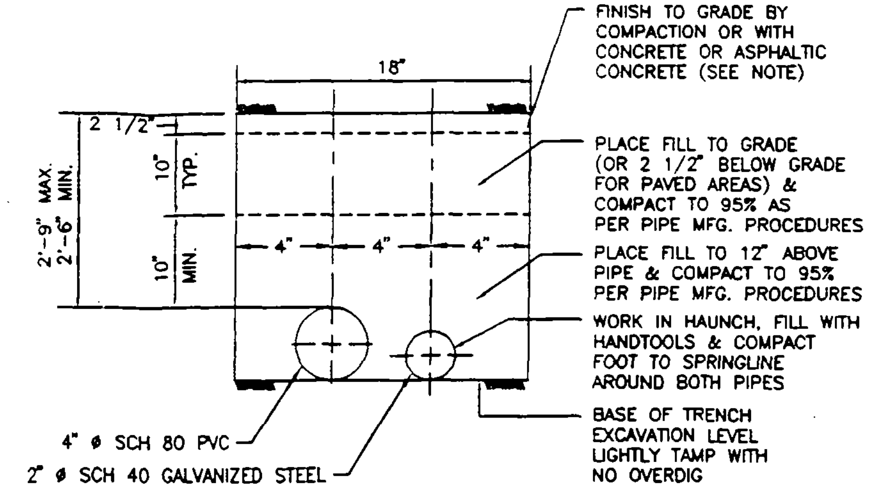
- ALL JOINTS SOLVENT WELDED
- STRAP FASTEN RISER TO WALL WITHIN 1 FT OF VALVES (TOP AND BOTTOM)

DETAIL 30
SCALE:NONE



VERTICAL HEADER TO VEW-84-1+3

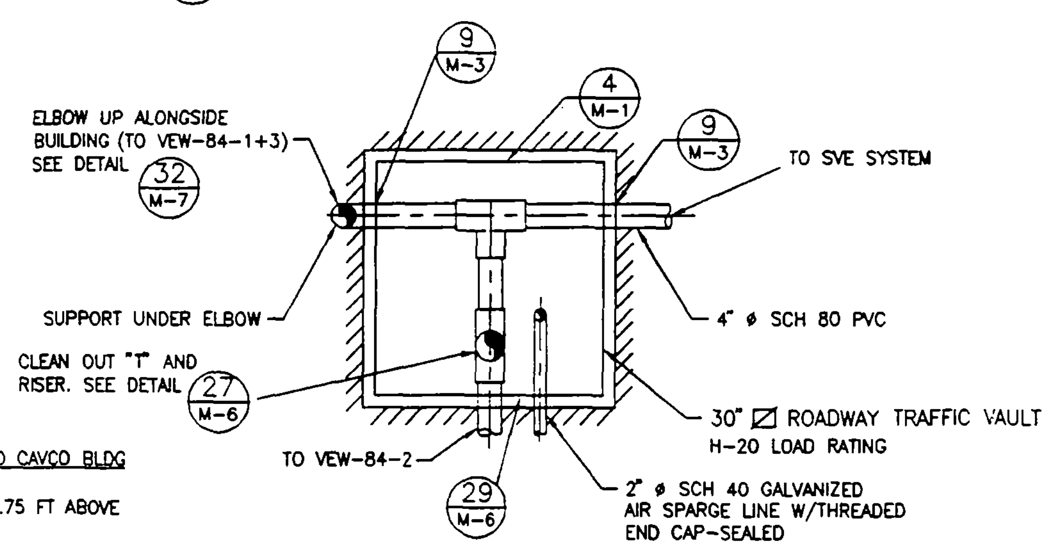
DETAIL 26
SCALE:NONE



TYPICAL DUAL PIPE TRENCH SECTION

- ALL TRENCHES NOT REQUIRING ASPHALT CUTTING WILL BE COMPLETED WITH COMPACTED FILL.
- TRENCHES REQUIRING CONCRETE OR ASPHALTIC CONCRETE WILL USE THE FOLLOWING:
  - A – ASPHALTIC CONCRETE: MINERAL, AGGREGATE & ASPHALT BINDER, PENETRATION AR4000, AGGREGATE TYPE B, 1/2" MAX., MEDIUM GRADING, CONFORM WITH CALTRANS SEC 29.
  - B – CONCRETE: 3000 PSI COMMERCIAL W/NO ADDITIVES.
- ALL PIPING TO SLOPE TO WELL OR VALVE BOXES.

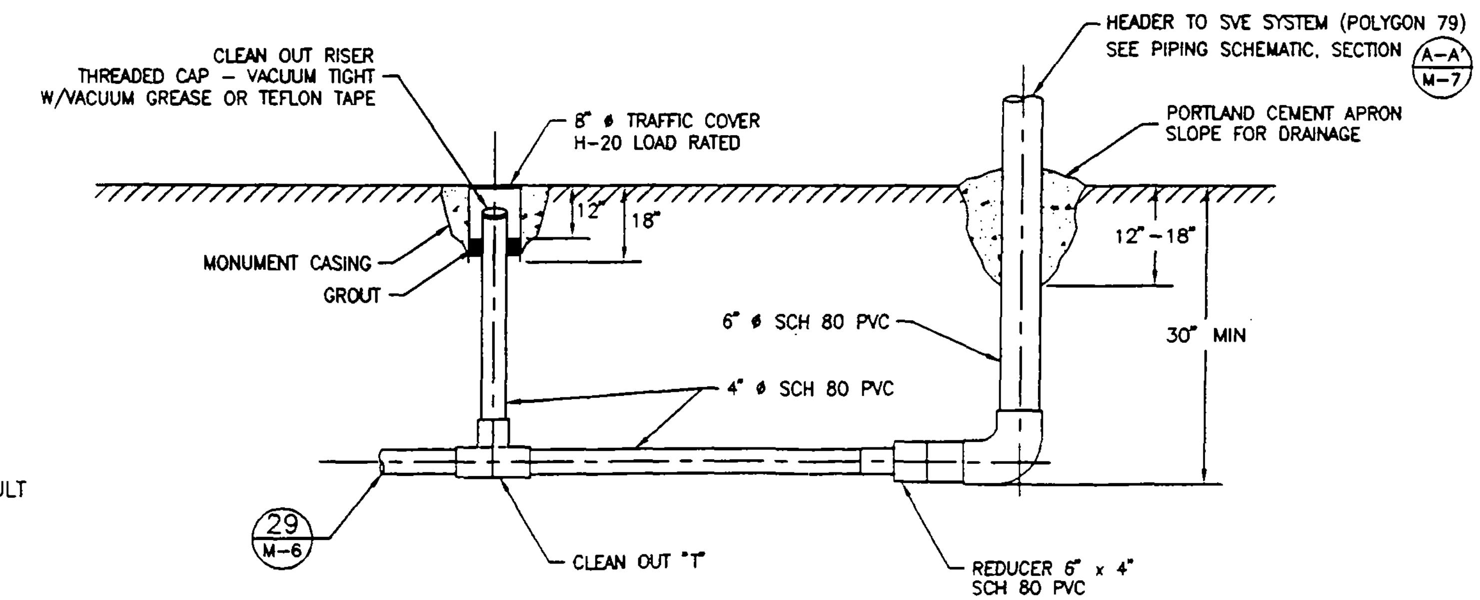
DETAIL 29
SCALE:NONE



TRAFFIC BOX ADJACENT TO CAVCO BLDG

- THREADED CAP 2" LINE 0.75 FT ABOVE BOTTOM OF VAULT
- "T" TO VEW-84-2 SLIP-SLIP SOLVENT WELD
- ROADWAY VAULT TO MEASURE 30" X 30" X 30" H-20 LOAD RATING

DETAIL 25
SCALE:NONE



UNDERGROUND ROADWAY CROSSING

- 6" ø TO 4" ø REDUCING BUSHING – SLIP-SLIP

DETAIL 27
SCALE:NONE

NUMBER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION

M&E METCALF & EDDY

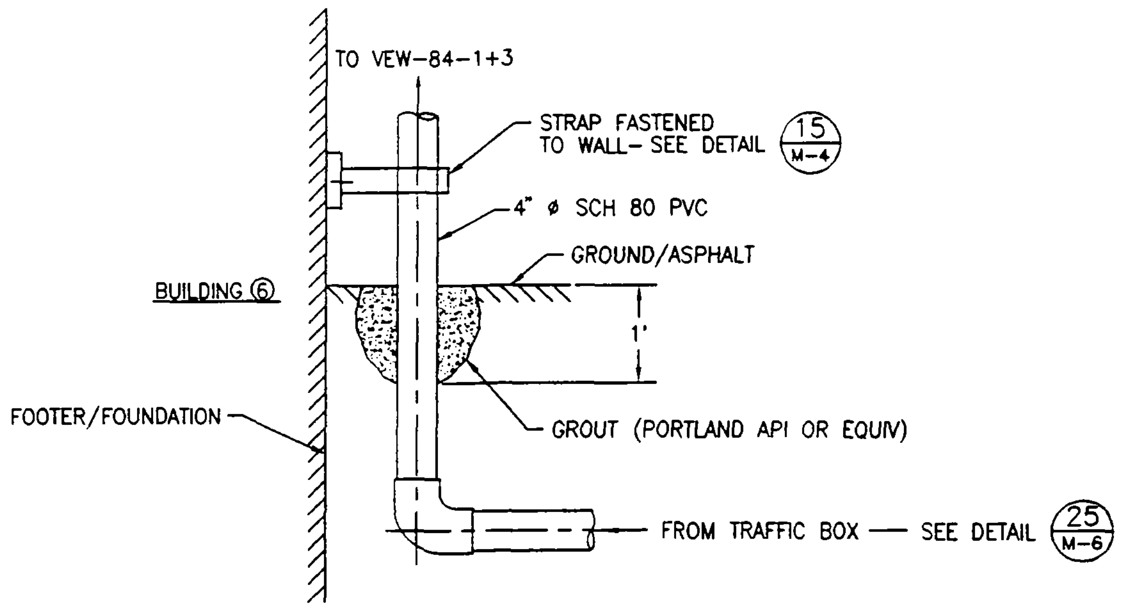
DESIGNED L.R.
DRAWN
CHECKED
SCALE: NONE
M&E SAN DIEGO 1994 DATE
CALIF. R.E. No.

PGA – Goodyear
APPROVED DATE

SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN – POLYGON 84/79
EXTRACTION WELLS AND PIPING DETAILS V

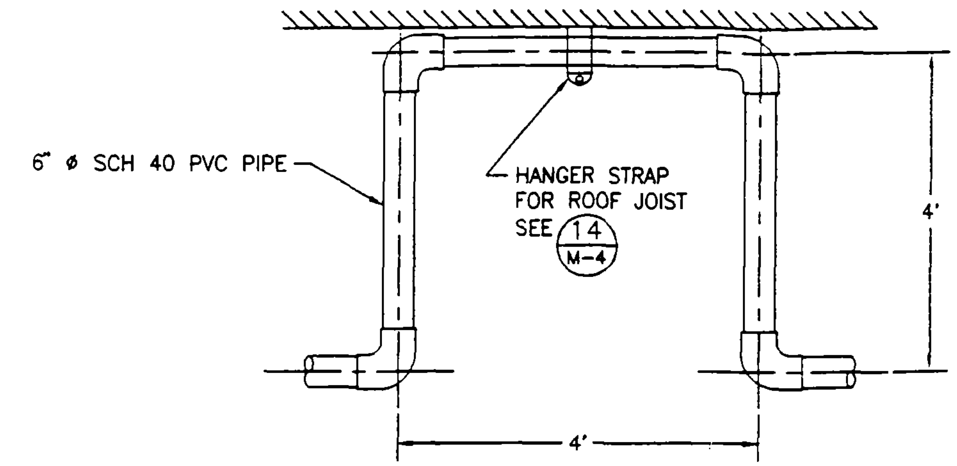
DRAWING NO: 84-M-6
SHEET: 9 OF 18 SHEETS

GY84M-6



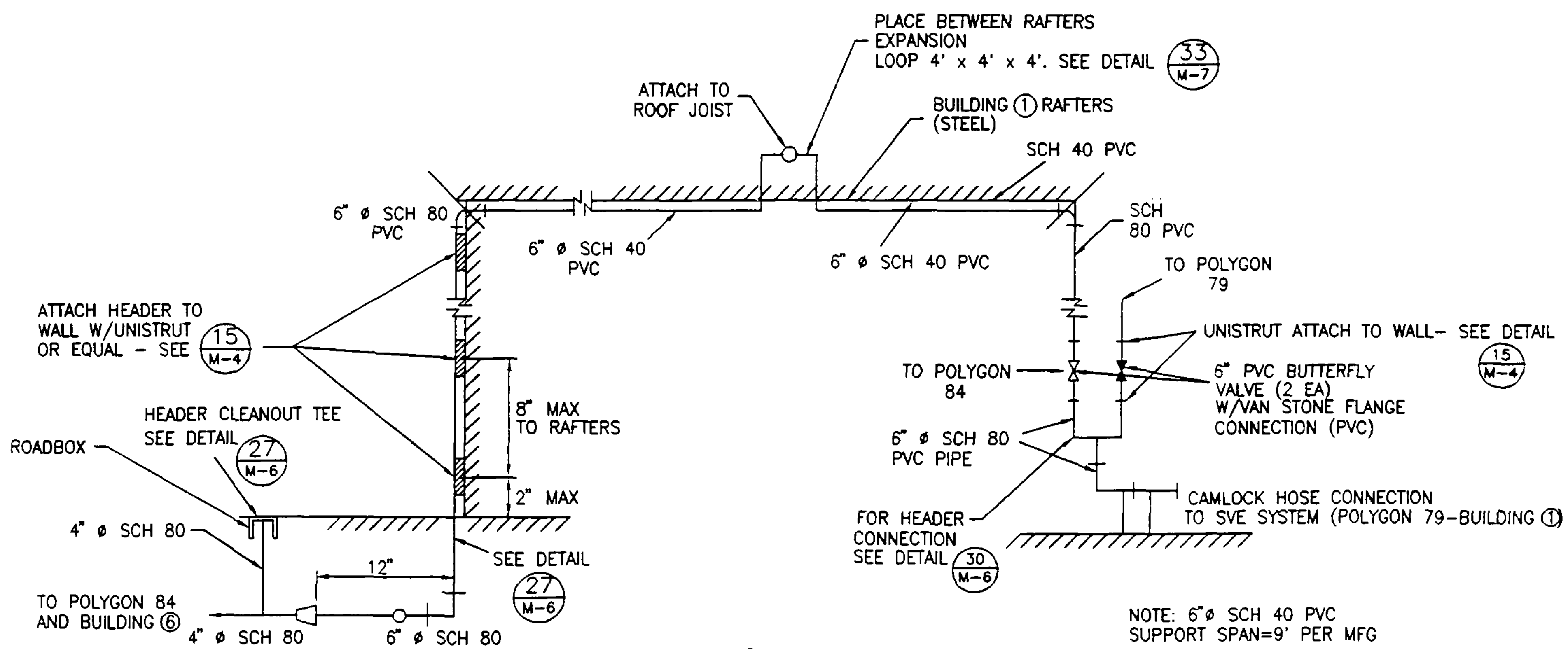
BUILDING ⑥ SUBSURFACE HEADER RISER

DETAIL (32)
SCALE:NONE



MAIN HEADER EXPANSION LOOP
ALSO SEE SECTION A-A' THIS SHEET

DETAIL (31)
SCALE:NONE



NOTE: 6"ø SCH 40 PVC SUPPORT SPAN=9' PER MFG

SETION A-A'
PIPING SCHEMATIC
SCALE:NONE

NUMBER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION

M&E METCALF & EDDY

DESIGNED	L.R.
DRAWN	
CHECKED	
SCALE:	NONE
M&E SAN DIEGO	1994 DATE
CALIF. R.E. No.	

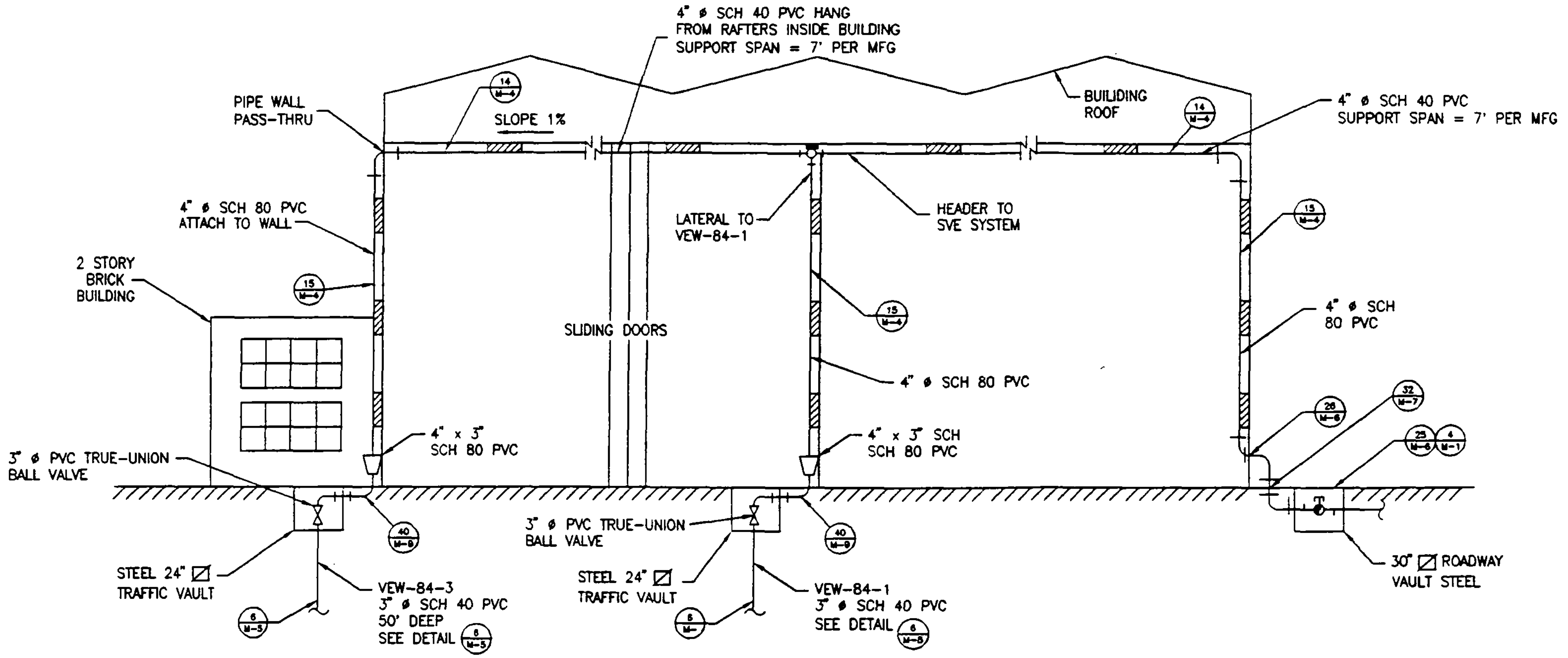
PGA - Goodyear

APPROVED DATE

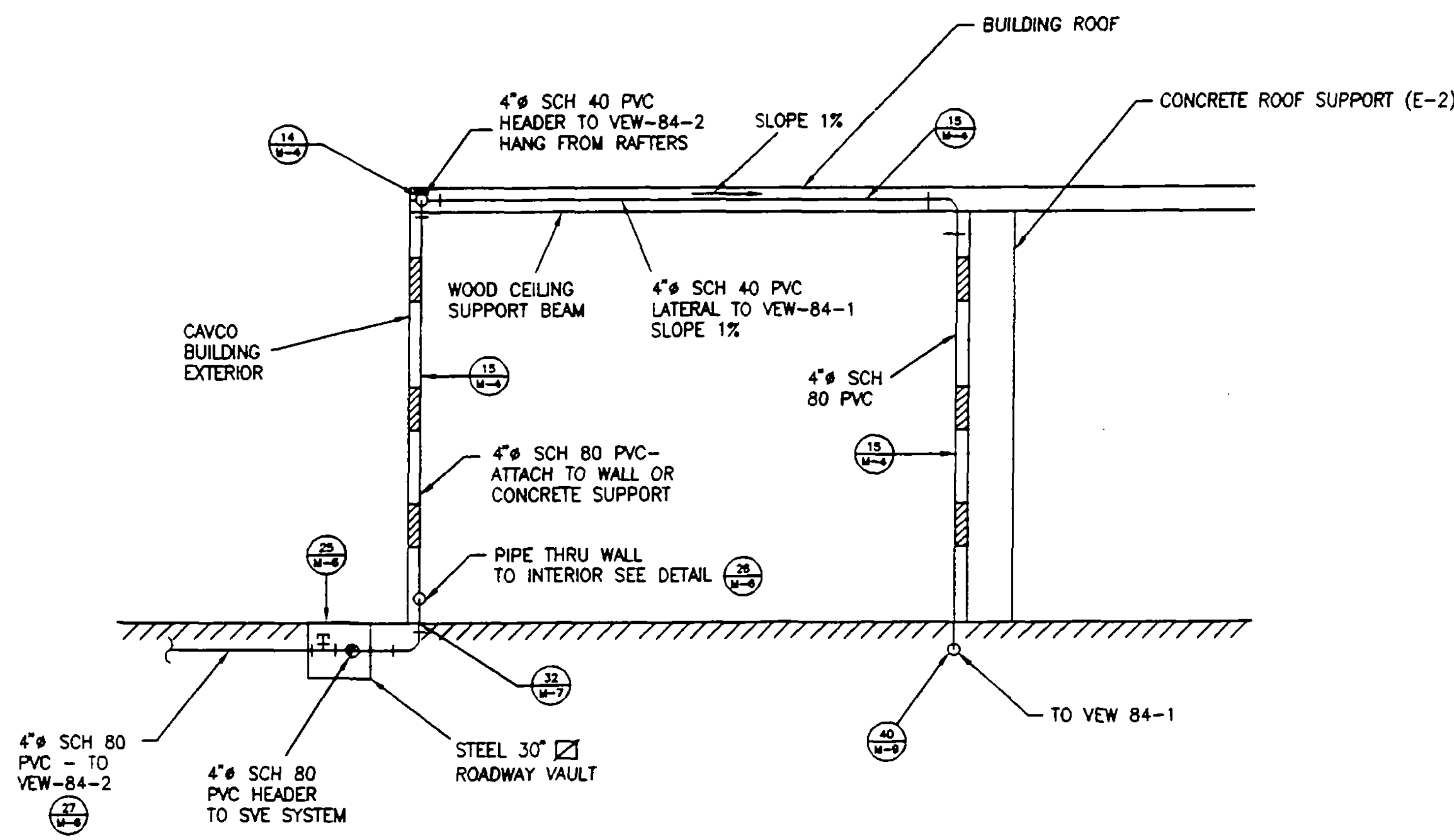
SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN - POLYGON 84/79
EXTRACTION WELLS AND PIPING DETAILS VI

DRAWING NO: 84-M-7
SHEET: 10 OF 18 SHEETS

GYT84M-7



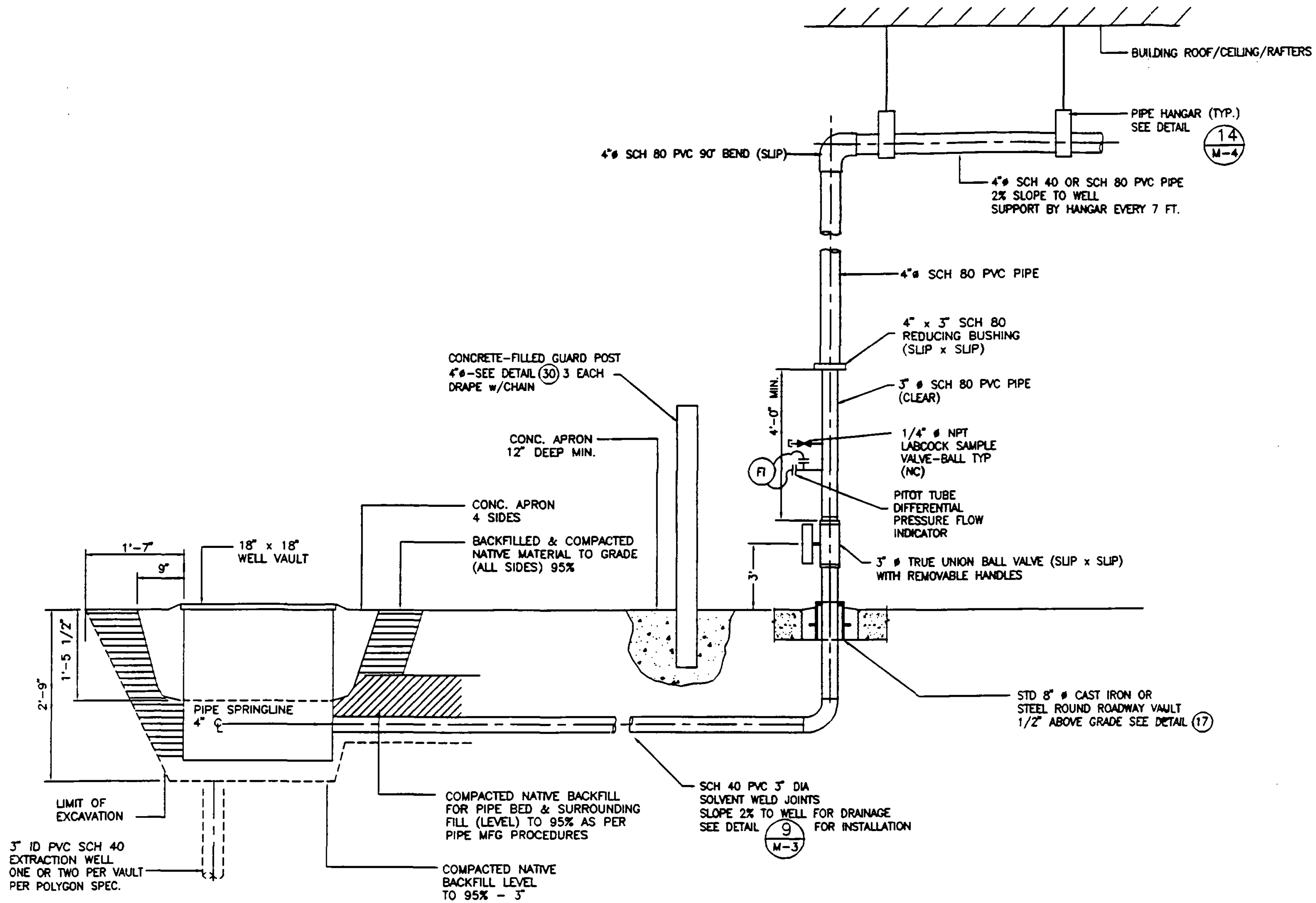
SECTION C–C'
PIPING SCHEMATIC



SECTION B–B'
PIPING SCHEMATIC

NUMBER / DATE / MADE BY / CHECKED / REVISION DESCRIPTION	
M&E METCALF & EDDY	
DESIGNED	L.R.
DRAWN	
CHECKED	
SCALE	NONE
MAP	SAN DIEGO
DATE	1994
CALIF. R.E. No.	
	PGA – Goodyear
APPROVED	DATE
	SOIL VAPOR EXTRACTION SYSTEM FINAL DESIGN – POLYGON 84/79
	EXTRACTION WELLS AND PIPING DETAILS VII
DRAWING NO.	84-M-8
SHEET	11 OF 18 SHEETS

GYT84M-8



WELL HEADER CONSTRUCTION DETAIL 40
SCALE:NONE

NUMBER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION
1	2-94	SZ		POLYGON 84 DESIGN

M&E METCALF & EDDY

DESIGNED L.R.
DRAWN
CHECKED
SCALE: NONE
M&E SAN DIEGO, CA 1994 DATE
CALIF. R.E. No.

PGA - Goodyear
APPROVED DATE

SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN - POLYGON 84/79
EXTRACTION WELLS AND PIPING DETAILS VIII

DRAWING NO: 84-M-9
SHEET: 12 OF 18 SHEETS

GYT84M-9

PROCESS FLOW AND INSTRUMENTATION DIAGRAM SYMBOLS

MEANINGS OF IDENTIFICATION LETTERS

THIS TABLE APPLIES ONLY TO THE FUNCTIONAL IDENTIFICATION OF INSTRUMENTS

INSTRUMENT & DEVICE LETTERING TABLE

LETTER	FIRST LETTER VARIABLE	SECOND AND SUCCEEDING LETTERS
A	ANALYSIS	ALARM
B	BURNER FLAME	CLOSE OR DECREASE
C	CONDUCTIVITY	CONTROL
D	DENSITY	OPEN OR INCREASE
E	VOLTAGE (EMF)	PRIMARY ELEMENT
F	FLOW RATE	FAILURE
G	USER CHOICE	
H	HAND (MANUAL)	HIGH
I	CURRENT (ELECT)	INDICATE
J	POWER	LIGHT
K	TIME	CONTROL STATION
L	LEVEL	LOW
M	MOTOR	OPERATE OR ON/OFF
N	MOISTURE	START/STOP OR OPEN/CLOSE
O	TORQUE	OVERLOAD
P	PRESSURE OR VACUUM	
Q	COMMON	TOTALIZE
R	RADIOACTIVITY	RECORDER
S	SPEED OR FREQUENCY	SWITCH
T	TEMPERATURE	TRANSMITTER
U	MULTIVARIABLE	MULTIFUNCTION
V	VALVE OR DAMPER	
W	WEIGHT OR FORCE	
X	VIBRATION, MOTION	EXCESS
Y	COMPUTER	RELAY OR CONTROL
Z	POSITION	DRIVE, ACTUATE OR FINAL CONTROL ELEMENT

INSTRUMENT LINES

- CONNECTION TO PROCESS, OR MECHANICAL LINK, OR INSTRUMENT SUPPLY
- ELECTRICAL SIGNAL
- E — ELECTRICAL POWER, 115 V, 60 Hz
- PNEUMATIC SIGNAL
- ELECTRICAL INTERLOCK SEE ELECTRICAL WIRING DIAGRAM

Symbol	Description
	CHECK VALVE
	GATE VALVE
	GLOBE VALVE
	SWING CHECK VALVE
	BUTTERFLY VALVE
	NEEDLE VALVE
	VACUUM RELIEF VALVE
M	MOTOR
	REDUCER
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NC	NORMALLY CLOSED
	PITOT TUBE
	CENTRIFUGAL PUMP
	POSITIVE DISPLACEMENT BLOWER
	TELEMETRY ANALOG INPUT
	TELEMETRY ANALOG OUTPUT
	TELEMETRY CONTACT INPUT
	TELEMETRY CONTACT OUTPUT
	AIR FILTER
SG 506	SITE GLASS
	SAMPLE TAP
AIC 506	FIRST LETTER; SUCCEEDING LETTERS (SEE TABLE ABOVE); LOOP NUMBER
AT 506	FIELD MOUNTED INSTRUMENT
AR 506 pH	PANEL MOUNTED INSTRUMENT
	PANEL MOUNTED BEHIND THE BOARD
HOA	HAND-OFF-AUTOMATIC
SS	START-STOP

ONE LINE & CONTROL DIAGRAM SYMBOLS

Symbol	Description
15/100	MOLDED CASE CIRCUIT BREAKER, THERMAL MAGNETIC TRIP, 3 - POLE UNO. UPPER NUMERAL INDICATES TRIP SETTING, LOWER NUMERAL INDICATES FRAME SIZE.
3 MCP	MOTOR CIRCUIT PROTECTOR, NUMERAL INDICATES CONTINUOUS CURRENT RATING.
3	CT = CURRENT TRANSFORMER, NUMERAL DENOTES QUANTITY
	TRANSFORMER, RATING AND VOLTAGE AS SHOWN
FVNR 2	MAGNETIC STARTER FVNR = FULL VOLTAGE, NON-REVERSING FVR = FULL VOLTAGE, REVERSING RVAT = REDUCED VOLTAGE, NON-REVERSING AUTO-TRANSFORMER TYPE RVSS = REDUCED VOLTAGE SOLID STATE VFD = VARIABLE FREQUENCY DRIVE C = MAGNETIC CONTACTOR (WITHOUT O.L.) NUMERAL INDICATES NEMA SIZE
	COMPONENT OUTLINE
5	SQUIRREL CAGE INDUCTION MOTOR, HORSEPOWER INDICATED
	GROUND
	CONDUCTOR CROSSING - NOT CONNECTED
	CONDUCTOR CROSSING - CONNECTED
	OVERLOAD HEATERS
	FUSE
	CONTROL POWER TRANSFORMER
	THREE POSITION SWITCH H-O-A HAND-OFF-AUTOMATIC
	NORMALLY OPEN CONTACT - COIL DEENERGIZED
	NORMALLY CLOSED CONTACT - COIL DEENERGIZED
	FIELD MOUNTED EQUIPMENT
	POWER DISTRIBUTION MODULE TERMINALS
	INSTRUMENT TERMINALS
	TELEMETRY TERMINALS
	LIMIT SWITCH
	LOCKOUT STOP MOMENTARY TYPE PUSHBUTTON
	MOMENTARY PUSHBUTTON--NORMALLY CLOSED
	MOMENTARY PUSHBUTTON--NORMALLY OPEN
	NORMALLY OPEN, TIME DELAY CLOSE - ON DELAY
	NORMALLY CLOSED, TIME DELAY OPEN - OFF DELAY
	FLOAT SWITCH
	PRESSURE SWITCH, NORMALLY CLOSED OPENS ON RISING PRESSURE
G	INDICATING LAMP A=AMBER, G=GREEN, R=RED, W=WHITE
M OL'S	MAGNETIC CONTACTOR COIL WITH OVERLOAD CONTACTS
TDR	TIME DELAY RELAY COIL
ETM	ELAPSED TIME METER
	FUSE, RATING INDICATED
200A	DISCONNECT SWITCH, NUMERAL INDICATES RATING
	EYS (EXPLOSION PROOF) SEAL

PLAN SYMBOLS

Symbol	Description
M	INDUCTION MOTOR - FOR HORSEPOWER RATING SEE PANELBOARD SCHEDULE OR ONE LINE DIAGRAM
	PUSHBUTTON OR CONTROL SWITCH IN NEMA 4 ENCLOSURE, SEE CONTROL DIAGRAMS. SEE DETAILS FOR MOUNTING. (4 = NEMA 4 ENCLOSURE, ETC)
	CONDUIT RUN, IF UNMARKED, CONDUIT IS 3/4" 2#12 CIRCUIT WIRES, 1#12 GROUND WIRE. CROSS LINES INDICATE NUMBER OF #12 WIRES IF MORE THAN TWO. LONG CROSS LINE INDICATES GROUND. SIZE CONDUIT PER NEC.
LA-2	HOME RUN FROM DEVICE TO PANEL LA. CIRCUIT NO. 2
	CONDUIT TURNING UP OR TOWARD OBSERVER
	CONDUIT TURNING DOWN OR AWAY FROM OBSERVER
	CONDUIT RUNS EXPOSED
T	CONDUIT FOR TELEPHONE COMPANY'S WIRING
	CONCEALED CONDUIT UNLESS NOTED OTHERWISE
G	GROUND WIRE
E	CONCEALED CONDUIT IN CONCRETE DUCT BANK
	CONDUIT (EMPTY) STUBBED OUT AND CAPPED
	LIQUID TIGHT FLEXIBLE CONDUIT
	GROUND ROD
	JUNCTION BOX - NEMA 1, NEMA 4 OUTDOORS
PIT 508	INSTRUMENT CALLOUT - SEE INSTRUMENTATION SYMBOL LIST FOR IDENTIFICATION. **

** WIRING ONLY BY ELECTRICAL CONTRACTOR

NUMBER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION
1	2/94	SZ		POLYGON 84 DESIGN

M&E METCALF & EDDY

DESIGNED ____ DRAWN ____ CHECKED ____ SCALE: NONE

MADE SAN DIEGO, CA 1994 DATE

CALIF. R.E. No. ____

PGA – Goodyear

APPROVED ____ DATE

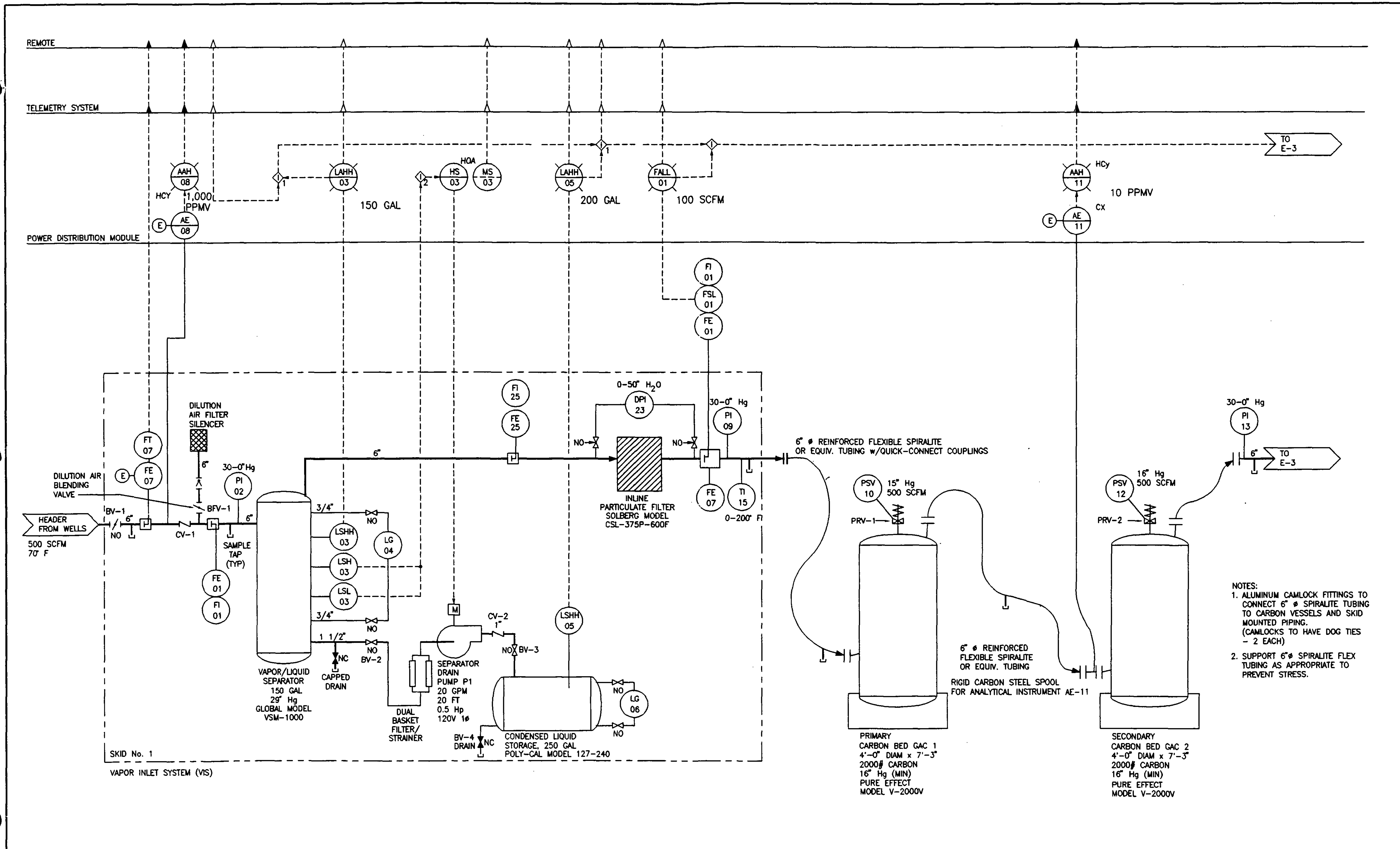
SOIL VAPOR EXTRACTION SYSTEM FINAL DESIGN – POLYGON 84/79

ELECTRICAL AND INSTRUMENTATION SYMBOLS

DRAWING NO: 84-E-1

SHEET: 13 OF 18 SHEETS

GY84E-1



NOTES:
1. ALUMINUM CAMLOCK FITTINGS TO CONNECT 6" ø SPIRALITE TUBING TO CARBON VESSELS AND SKID MOUNTED PIPING. (CAMLOCKS TO HAVE DOG TIES - 2 EACH)
2. SUPPORT 6"ø SPIRALITE FLEX TUBING AS APPROPRIATE TO PREVENT STRESS.

NUMBER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION
1	3-22-93	IB		ELEC. PER MFG. CHANGE
2	10-26-93	IB		CHANGES FOR RECORD DRAWING
3	2-94	SZ		POLYGON 84 DESIGN

M&E METCALF & EDDY

DESIGNED
DRAWN
CHECKED

SCALE: NONE

M&E SAN DIEGO, CA 1994 DATE
CALIF. R.E. No.

PGA - Goodyear

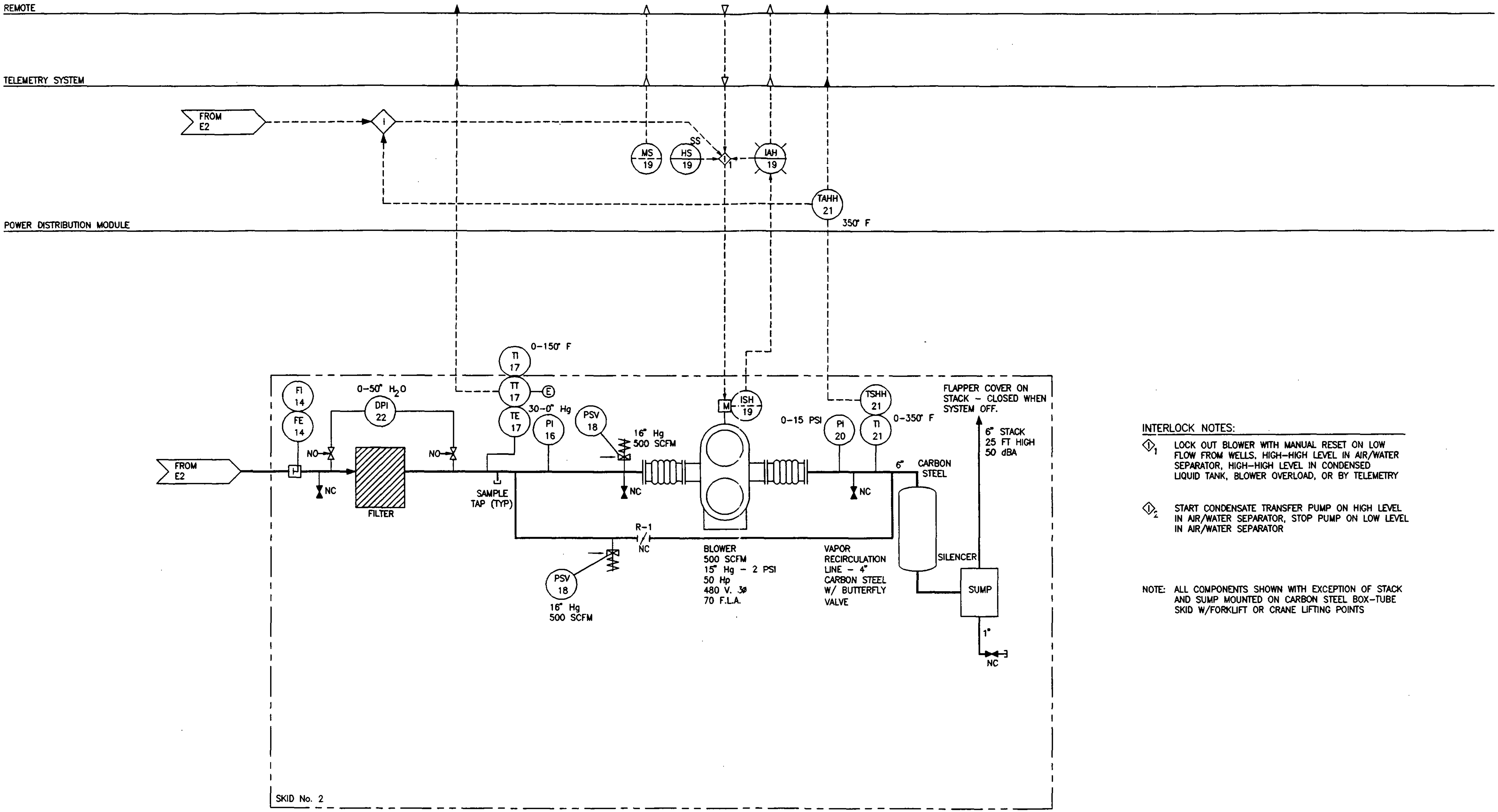
APPROVED DATE

SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN - POLYGON 84/79

PROCESS & INSTRUMENTATION DIAGRAM 1

DRAWING NO: 84-D-2
SHEET: 14 OF 18 SHEETS

GYT84E-2



INTERLOCK NOTES:

1. LOCK OUT BLOWER WITH MANUAL RESET ON LOW FLOW FROM WELLS, HIGH-HIGH LEVEL IN AIR/WATER SEPARATOR, HIGH-HIGH LEVEL IN CONDENSED LIQUID TANK, BLOWER OVERLOAD, OR BY TELEMETRY

2. START CONDENSATE TRANSFER PUMP ON HIGH LEVEL IN AIR/WATER SEPARATOR, STOP PUMP ON LOW LEVEL IN AIR/WATER SEPARATOR

NOTE: ALL COMPONENTS SHOWN WITH EXCEPTION OF STACK AND SUMP MOUNTED ON CARBON STEEL BOX-TUBE SKID W/FORKLIFT OR CRANE LIFTING POINTS

NUMBER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION
1	3-22-93	IB		ELEC. PER MFG. CHANGE
2	10-26-93	IB		CHANGES FOR RECORD DRAWING
3	2-94	SZ		POLYGON 84 DESIGN

M&E METCALF & EDDY

DESIGNED
DRAWN
CHECKED

SCALE: NONE

M&E SAN DIEGO, CA 1994 DATE
CALIF. R.E. No.

PGA - Goodyear

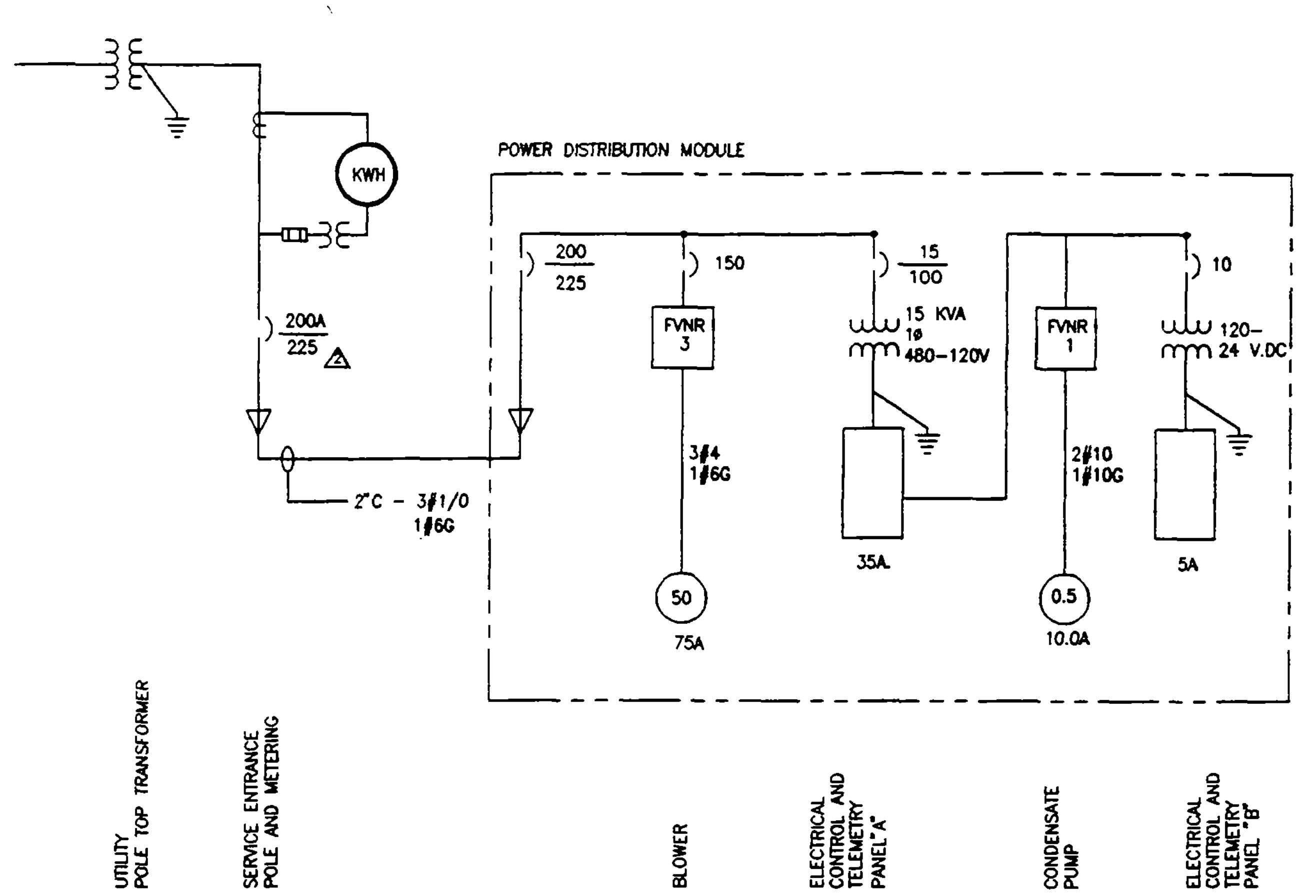
APPROVED DATE

SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN - POLYGON 84/79

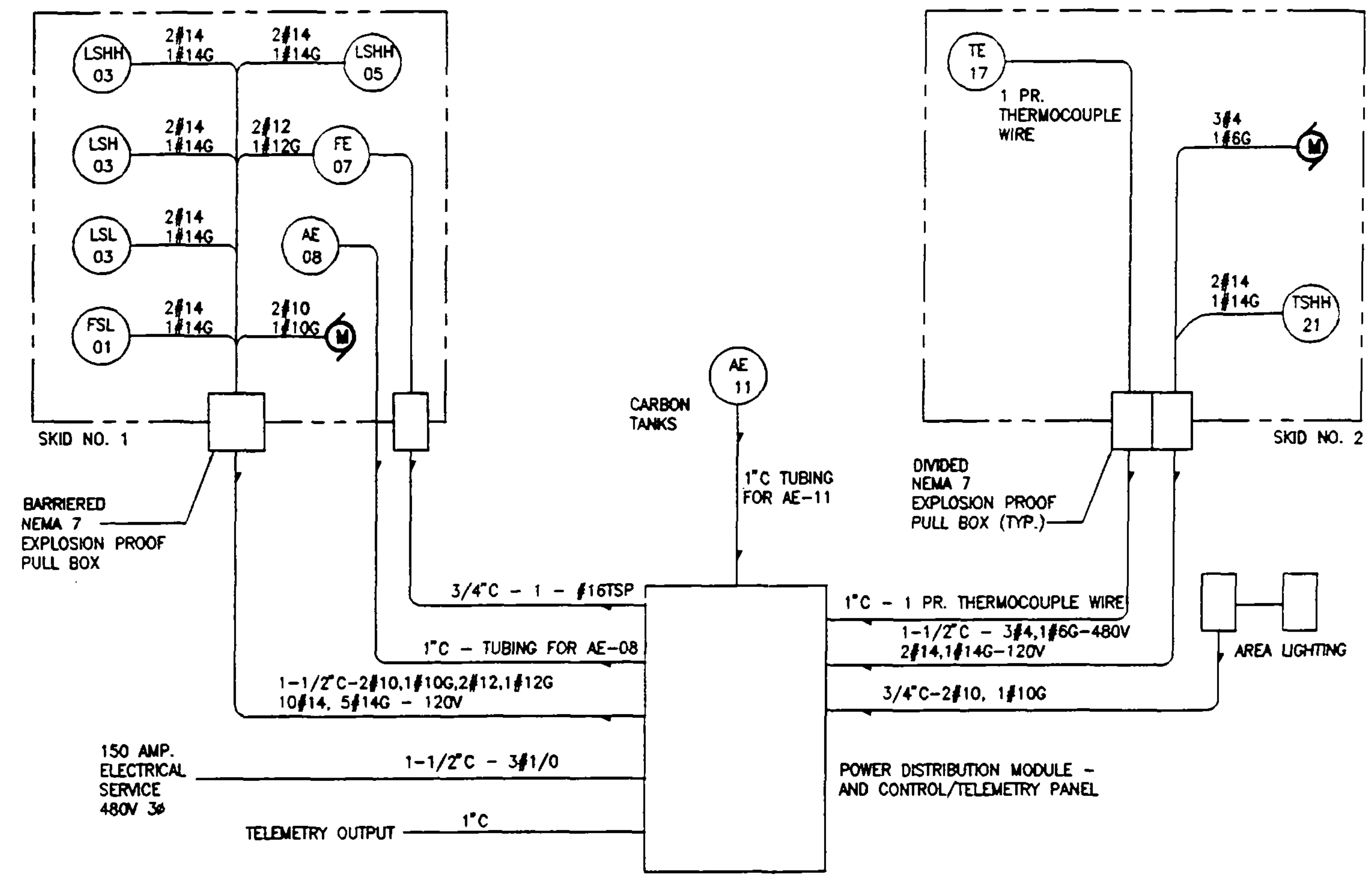
PROCESS & INSTRUMENTATION DIAGRAM 2

DRAWING NO: 84-D-3
SHEET: 15 OF 18 SHEETS

GYT84E-3



ONE LINE DIAGRAM



ELECTRICAL INTERCONNECTION DIAGRAM

Main: 125

Load	Circuit	Breaker	Breaker	Circuit	Load
BLOWER CONTROL	1	15	15	2	SYSTEM CONTROL
CONDENSATE PUMP CONTROL	3	50	15	4	AE-11
PDM RECEPTACLES	5	20	15	6	PDM LIGHT
AREA LIGHTS	7	20	15	8	TELEMETRY UNIT
SPARE	9	20	15	10	AE-08
SPARE	11	20	15	12	FI-07
SPARE	13	20	20	14	SPARE
SPARE	15	20	15	16	SPARE
SPARE	17	15	15	18	SPARE
SPARE	19	15	15	20	SPARE

PANEL "A" SCHEDULE

* ALL RECEPTACLE CIRCUITS TO HAVE GROUND FAULT CIRCUIT INTERUPTER TYPE CIRCUIT BREAKER

NUMBER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION
1	3-22-93	IB		ELECTRICAL PER MFG. CHANGE
2	10-26-93	IB		CHANGES FOR RECORD DRAWING

M&E METCALF & EDDY

DESIGNED ______ DRAWN ______ CHECKED ______

SCALE: NONE

MGR. ______ DATE

CALIF. R.E. No. ______

PGA - Goodyear

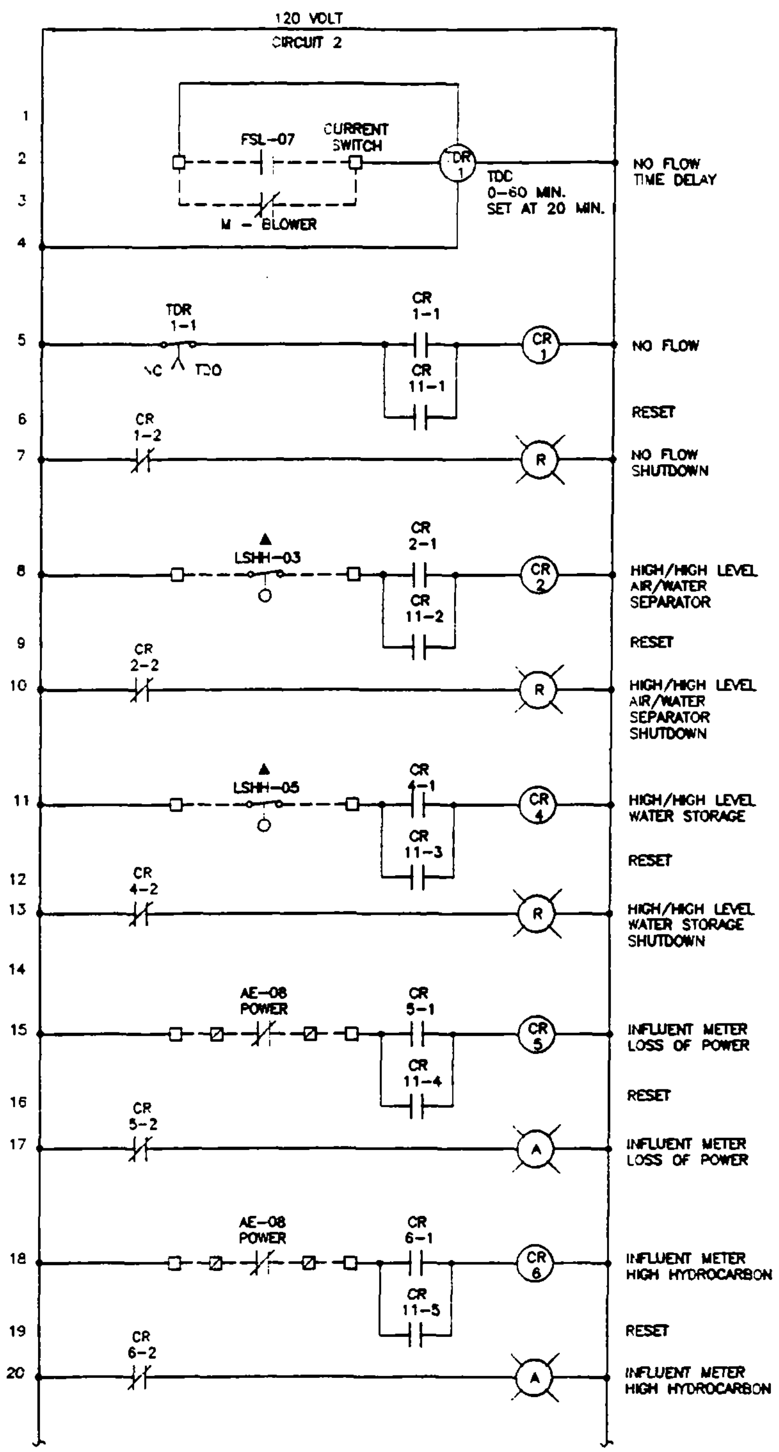
APPROVED ______ DATE

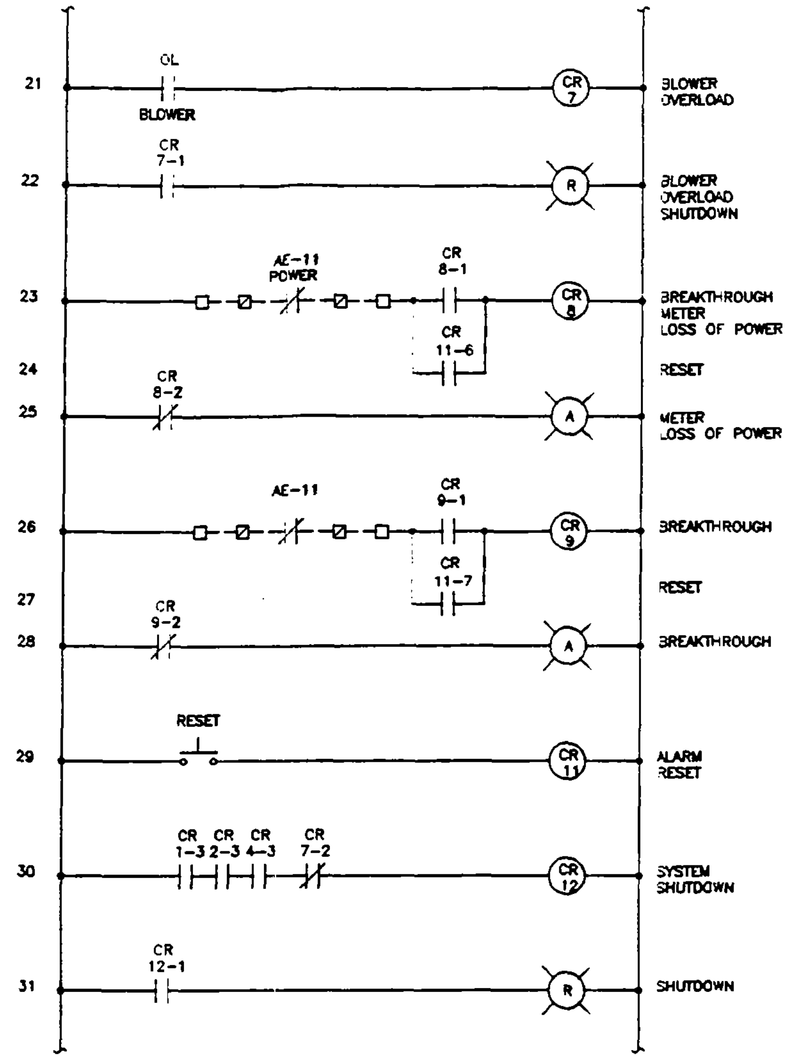
SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN - POLYGON 84/79

ELECTRICAL
ONE LINE AND INTERCONNECTION DIAGRAM

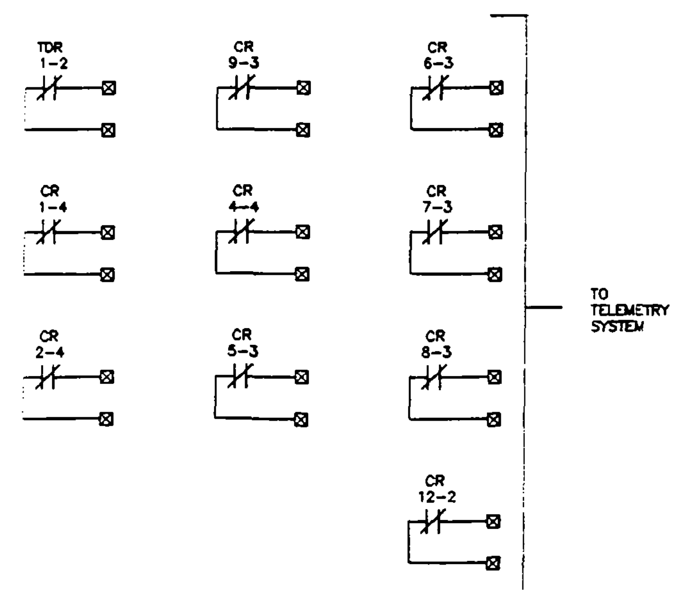
DRAWING NO: 84-E-4
SHEET 16 OF 18 SHEETS

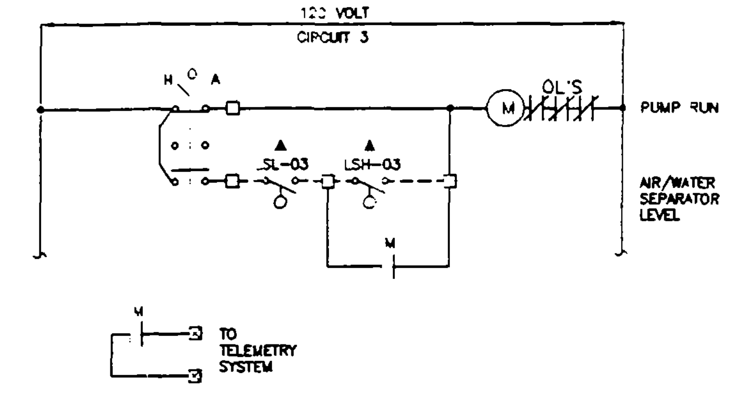
GYT84E-4



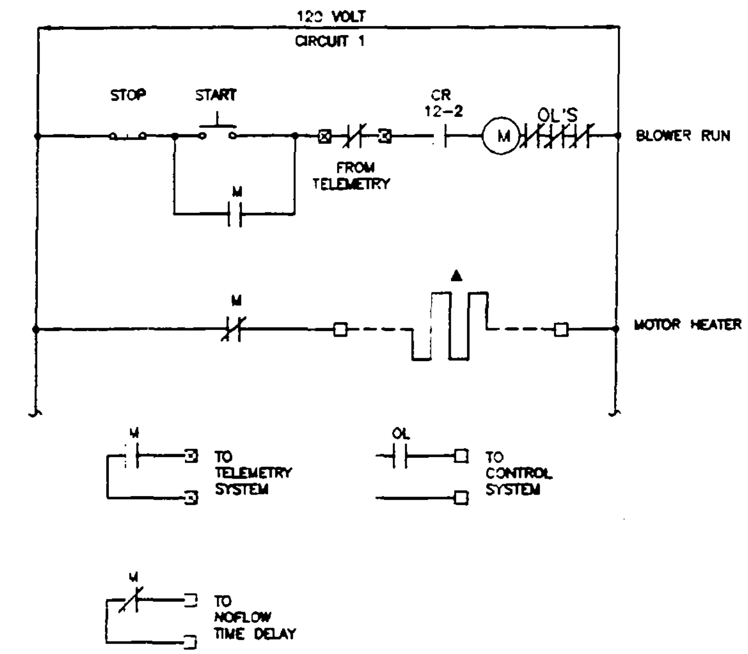


SYSTEM CONTROL DIAGRAM





CONDENSATE TRANSFER PUMP WIRING DIAGRAM



BLOWER WIRING DIAGRAM

⚠ NOTE: LADDER LOGIC IS ACCOMPLISHED USING PLC.
SEE BYRD ELECTRONICS DRAWINGS AMFIL 3 THRU 10

NUMBER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION
⚠	10/26/93	IB		RECORD DRAWING

M&E METCALF & EDDY

DESIGNED ______ DRAWN ______ CHECKED ______

SCALE: NONE

M&E ______ DATE
CALIF. R.E. No. ______

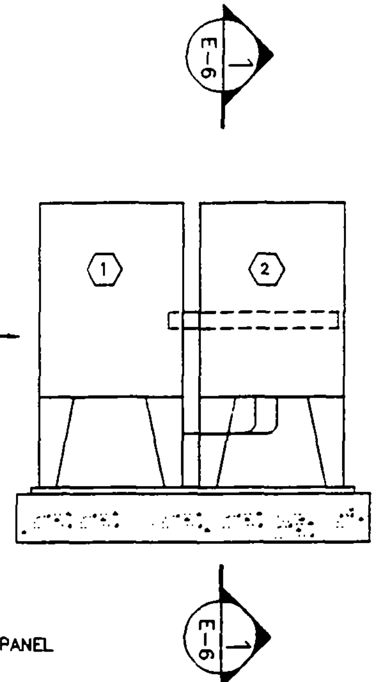
PGA - Goodyear

APPROVED ______ DATE

SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN - POLYGON 84/79

ELECTRICAL CONTROL WIRING DIAGRAM

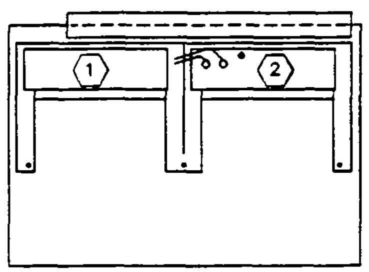
DRAWING NO: 84-E-5
SHEET 17 OF 18 SHEETS



1 CONTROL/TELEMETRY PANEL

2 POWER DISTRIBUTION PANEL & MOTOR CONTROL CENTER

ELEVATION



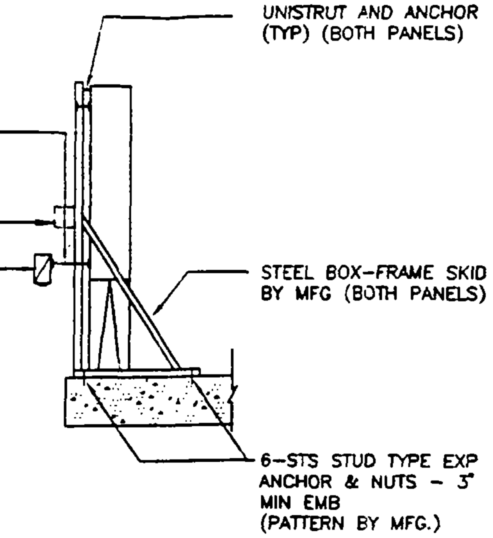
PLAN

ELECTRICAL CONTROL PANELS

SCALE: NONE

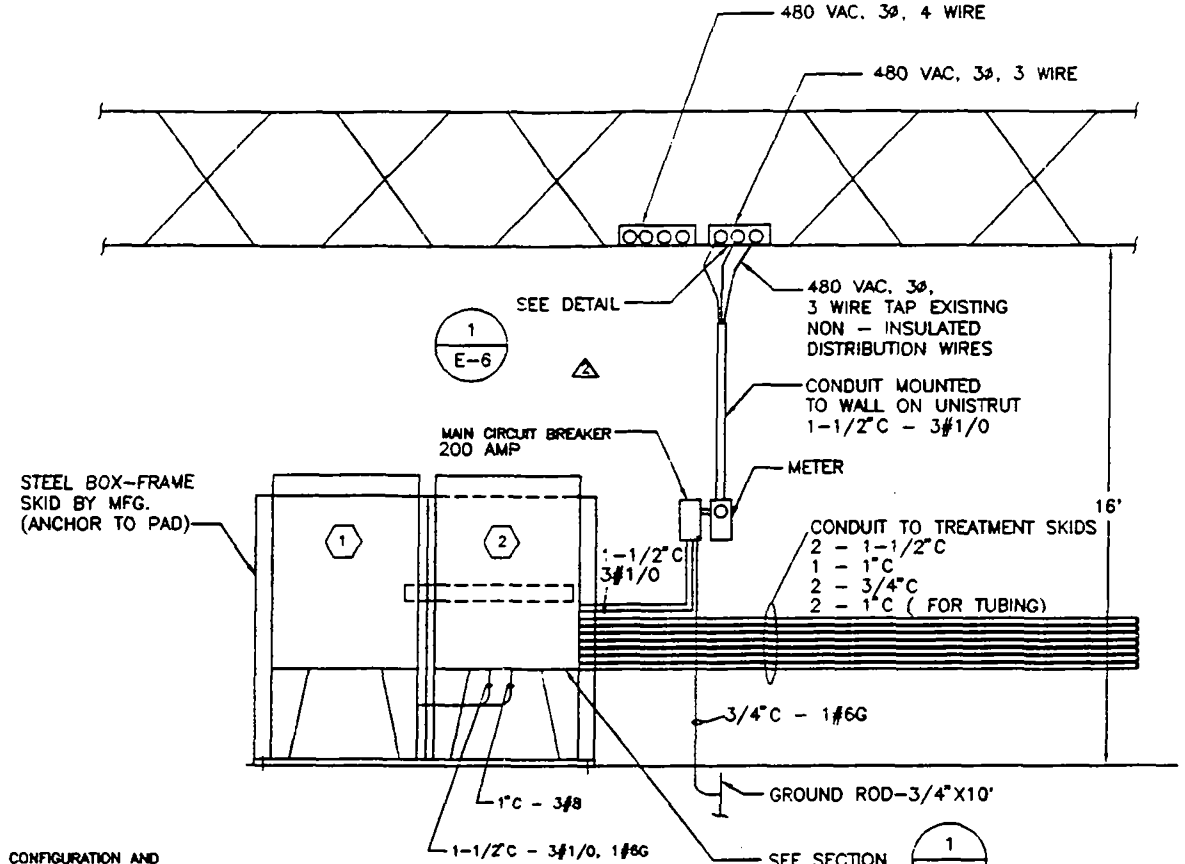
NOTES:

1. SEE AMERICAN FILTRATION SYSTEMS DRAWING NO. 8788-05 FOR DETACHED ELECTRICAL CONTROL SYSTEM ARRANGEMENT
2. SEE BYRD ELECTRONICS DRAWING NO. AMFIL 6, 9, AND 10 FOR ELECTRICAL AND CONTROL PANELS LAYOUT.



SECTION 1/E-6

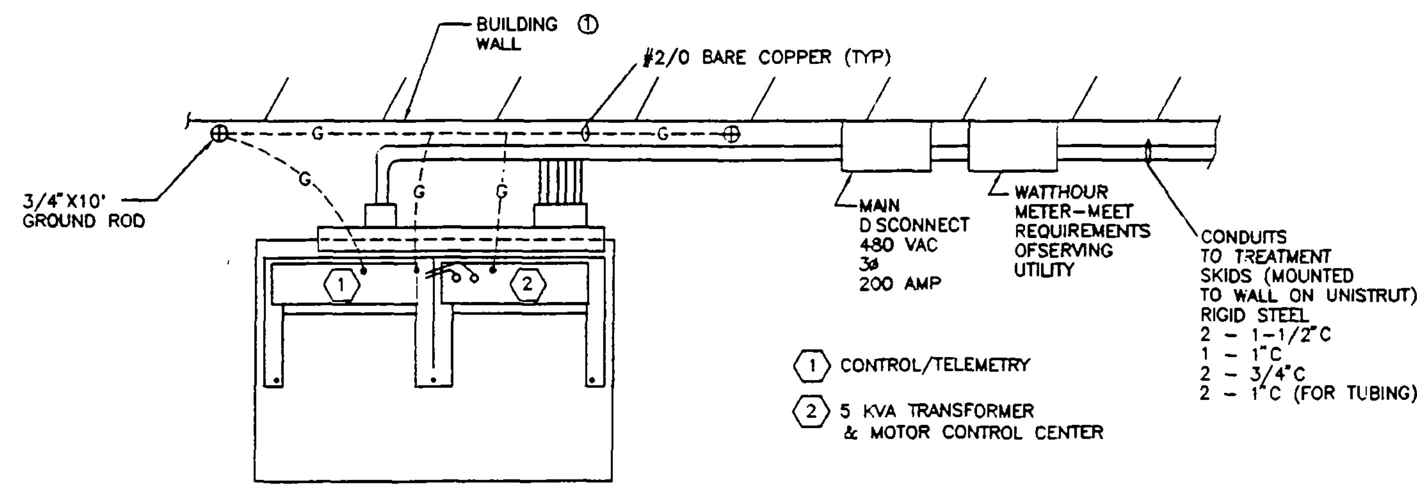
SCALE: 1/2"=1'-0"



NOTE:
FINAL POWER PANEL CONFIGURATION AND ELECTRICAL CONNECTION PER MFG. DRAWINGS TO BE SUBMITTED APRIL/MAY-1993.

DETAIL
POWER/CONTROL PANEL CONNECTION (21)

SCALE: NONE



1 CONTROL/TELEMETRY

2 5 KVA TRANSFORMER & MOTOR CONTROL CENTER

PLAN

DETAIL
PLANVIEW-POWER/CONTROL PANEL CONNECTION (22)

SCALE: NONE

NUMBER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION
1	3-22-93	IB		ELEC. PER MFG. CHANGE
2	10-26-93	IB		CHANGES FOR RECORD DRAWING
3	2-94	SZ		POLYGON 84 DESIGN

M&E METCALF & EDDY

DESIGNED ____ DRAWN ____ CHECKED ____

SCALE: NONE

SAN DIEGO, CA 1994 DATE

CALIF. R.E. No. ____

PGA - Goodyear

APPROVED ____ DATE

SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN - POLYGON 84/79

ELECTRICAL CONTROL PANELS

DRAWING NO: 84-E-6

SHEET: 18 OF 18 SHEETS

GY84E-6

APPENDIX B

DRAFT SVE OPERABLE UNIT AND WELL OPERATION & MAINTENANCE MANUAL (POLYGON 79/84)

APPENDIX B

DRAFT SVE OPERABLE UNIT AND WELL OPERATION & MAINTENANCE MANUAL

The November 5, 1993 Final Soil Vapor Extraction (SVE) Operable Unit Operation and Maintenance (O&M) Manual developed for Polygon 79 is the current document guiding the SVE system operations and maintenance. This O&M Manual will be revised for Polygon 84 and submitted in accordance with Consent Decree schedule requirements. Revisions to the November 5, 1993 Polygon 79 O&M Manual will include operation of the Polygon 84 fully-penetrating extraction wells, operation of wells within Polygons 79 and 84 simultaneously (if needed), and establishment of Polygon 84 ARM and lower-ARM soil vapor concentrations for initiation of rebound cycles.

A Draft SVE O&M Manual for Polygon 84 will be submitted 30 days prior to system start up for that polygon (Consent Decree deliverable, Section VII, D-13). The Draft SVE O&M Manual will be revised after start up with the Final SVE O&M Manual for Polygon 84 to be submitted within 60 days after SVE system start up (1990 Consent Decree, Section VII, Subsection D.14, p. 22).

APPENDIX C

CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN (POLYGON 79/84)

APPENDIX C

CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN

<u>Preface</u>

The Construction Quality Assurance Project Plan (CQAPjP) outlines the methods by which the Phoenix Goodyear Airport (PGA) Soil Vapor Extraction (SVE) Operable Unit remedial design and construction for Polygon 84 shall be measured and controlled to ensure the desired level of performance for the installation and operation of the SVE operable unit at each polygon. This CQAPjP identifies quality elements which will be verified during each facet of the fabrication and erection of the project. The goals of this CQAPjP are to:

- Maintain sufficient control over design, field construction, and testing of facilities or equipment to assure quality workmanship, integrity of the materials of construction, conformance to specifications, and compliance with provisions of contracts and statements of work, and the 1990 Consent Decree (Section X).

- Ensure that appropriate quality requirements are included within contracts and statements of work with construction contractors and subcontractors.

- Ensure that all changes to drawings and specifications are approved in writing by an appropriate level of project management. These review and approval authorities shall be specified in writing. As-built drawings and specifications shall be generated as necessary.

- Ensure that independent inspections are performed and documented at specified hold points. Deficiencies and nonconformances shall be reported to appropriate management through an established system and the corrective actions documented.

(1) Title Page.

Contract Number: 012014.00xx

Project Title: Phoenix Goodyear Airport Soil Vapor Extraction Operable Unit

EPA region: IX

Deputy Program Manager:	______________________ Signed
QA Manager:	______________________ Signed
Deputy Program Manager:	______________________ Signed
Site Manager:	______________________ Signed
EPA Remedial Project Manager:	______________________ Signed
Regional QA Officer:	______________________ Signed

(2) Table of Contents

(3) Project Scope/Description. This CQAPjP is for the site remediation of vadose zone soils contaminated with chlorinated solvents as outlined in the Consent Decree, Section VII. The contaminants are known or suspected carcinogens and may be deemed hazardous at the concentrations present. Recovered contaminants collected in the treatment process are deemed hazardous under existing regulatory guidelines.

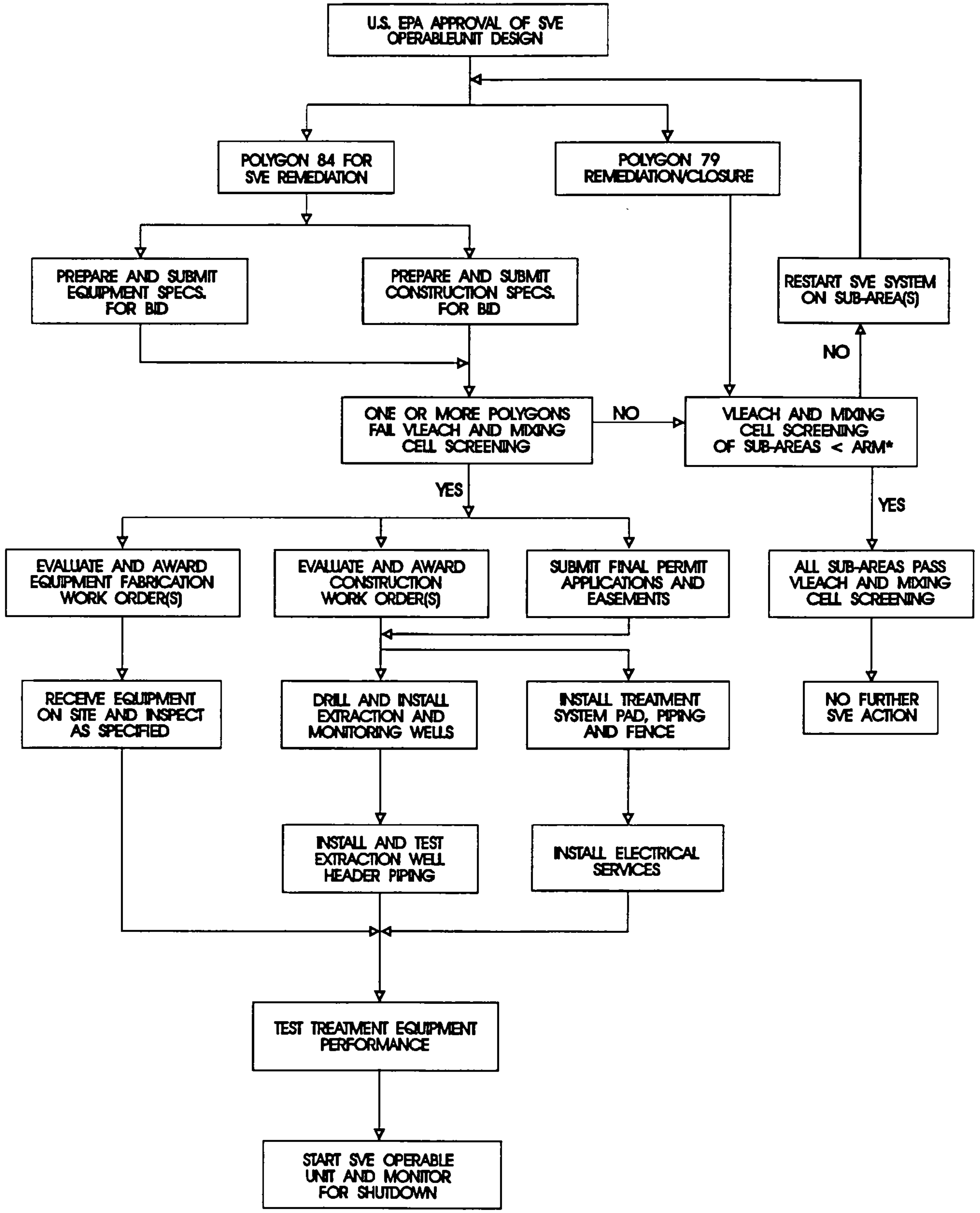
This CQAPjP covers the detailed design, and installation of Polygon 84 extraction wells, monitoring wells and piping conveyance systems, as well as startup of the major components of the vapor extraction system. The purpose of the CQAPjP is to ensure that the system functions as intended and that all components which comprise the system satisfy their performance criteria. The following is included in the CQAPjP:

- Work Flow Diagram (Figure C3-1)
- Start, Milestone and Completion Dates (Figure C3-2)

This CQAPjP applies in part or whole, as appropriate, to the successful bidders for the following components which make up the Polygon 84 Vapor Extraction System (VES):

(4) Project Responsibilities and Authorities. The personnel responsible for administering the CQAPjP are shown in Figure C4-1. or chart shall show the project organization and line authority.

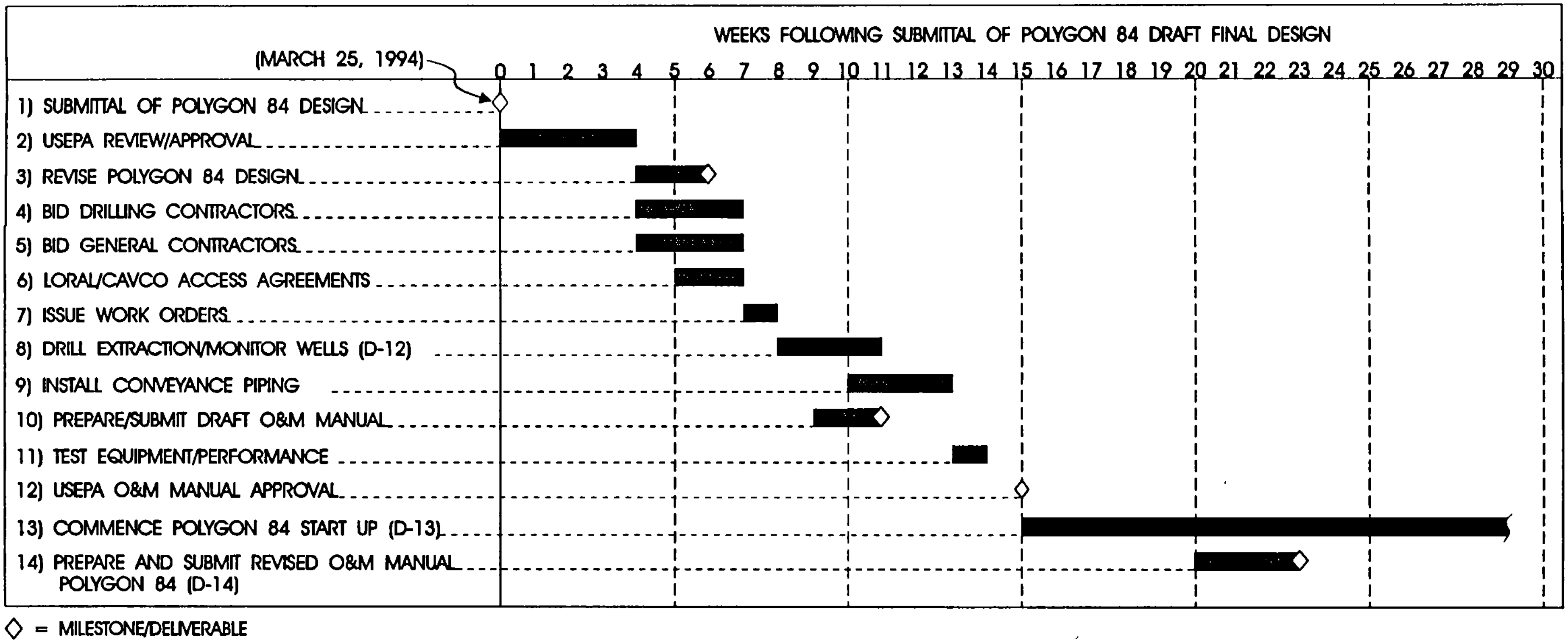
The M&E Project Manager, Mr. Scott Zachary, is responsible for preforming quality assurance functions. Mr. Zachary has sufficient authority and organizational freedom to identify project problems; to initiate, recommend, or provide solutions; and to verify implementation of solutions. Mr. Zachary may appoint project personnel to assist him with CQAPjP activities as he deems necessary or appropriate. Mr. Zachary's activities will, in turn, be monitored by M&E's Technical Advisory Team (TAT), which



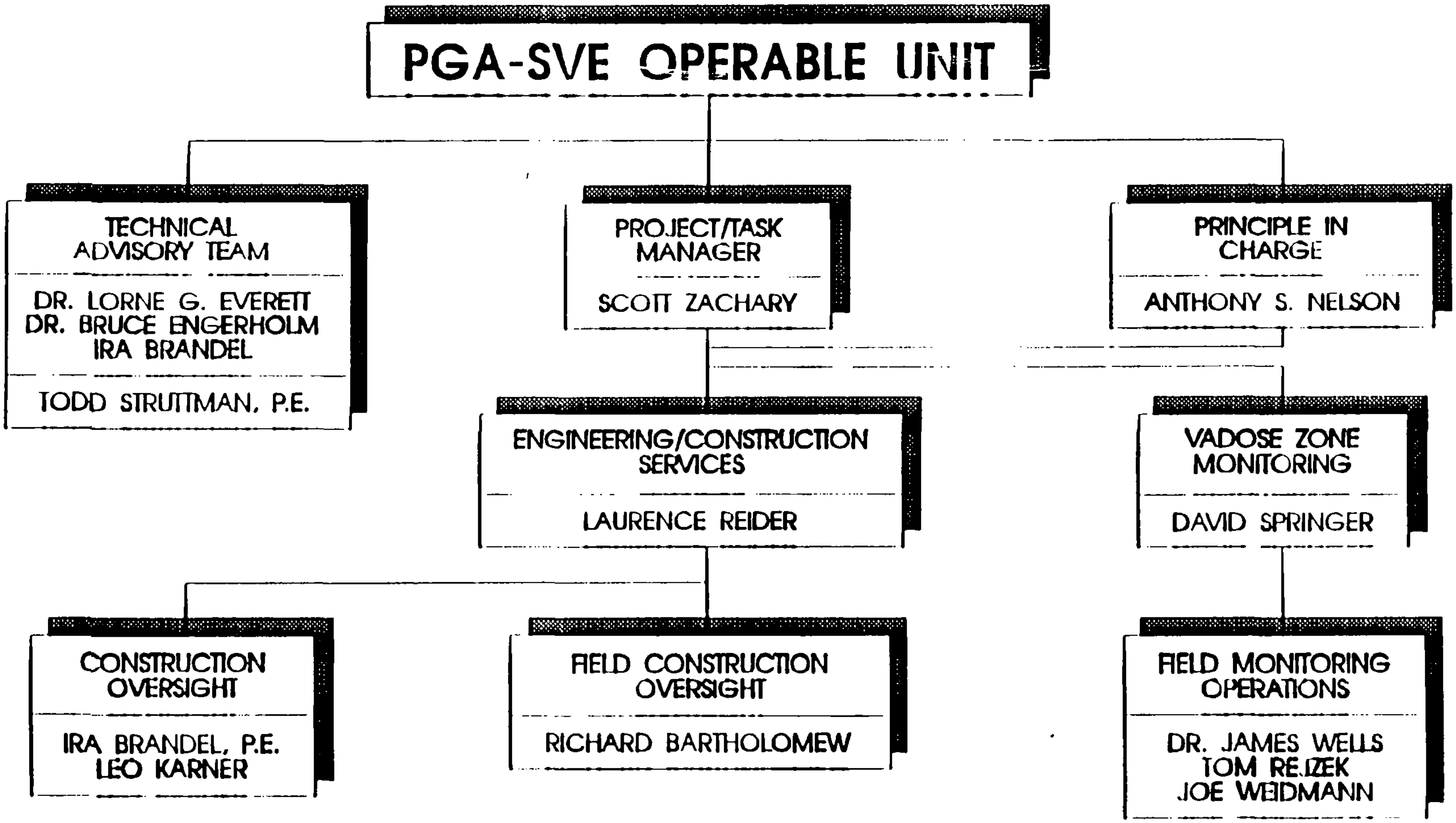
* ARM = ALLOWABLE RESIDUAL MASS FOR NO SVE REMEDY

** = FOR SIMULTANEOUS POLYGON 79/84 SVE TREATMENT

CONSTRUCTION WORK FLOW DIAGRAM		
M&E Metcalf & Eddy		
Drawn by: J. Weidmann	Job Number: 012014	Date: March 1994
Checked by: S. Zachary		Figure Number: C3-1



CONSTRUCTION WORK SCHEDULE		
M&E Metcalf & Eddy		
Drawn by: J. Weldmann	Job Number: 012014	Date: March 1994
Checked by: S. Zachary		Figure Number: C3-2



ORGANIZATION CHART

M&E Metcalf & Eddy

Drawn by: J. Weldmann	Job Number: 006791	Date: September 1992
Checked by: S. Zachary		Figure Number: C4-1

consists of senior M&E professionals not directly involved in project activities. The TAT is independent of schedule and cost pressures and has access to a management level that is not involved in the day-to-day direction of the project.

(5) Quality Assurance Training/Qualification. M&E's corporate policy is that every project have a Health & Safety (H&S) component. Field personnel are trained in safe field practice. As such, field personnel are only assigned tasks for which they are qualified. Furthermore, applicable Federal, State and local rules, regulations and ordinances are made a part of the H&S plan. M&E's subcontractors are required to satisfy project H&S criteria and sign the H&S plan.

Appendix G of this document contains the Site and Task-Specific H&S Plan for the construction and operation of the SVE Operable Unit. All contractors and subcontractors working within this work plan will be required to conform to the requirements of the H&S Plan (Appendix G).

The qualifications of each subcontractor to do the subcontracted task will be reviewed based on the firm's previous project experience, satisfaction of previous contracting entities and business reputation. Each major subcontractor will be required to submit a portfolio of experience and identify references or contacts knowledgeable of the firm's work. M&E will review the documentation of experience and contact references, or others knowledgeable of the candidate subcontractor's work history. The qualifications of construction quality assurance, inspection, and test personnel shall be in accordance with established procedures.

(6) Design Control. To ensure that field construction quality is achieved, M&E will prepare a field erection specification which will include construction quality assurance, inspection and documentation requirements. These requirements will be placed in the bidding specification documents submitted to the potential subcontractors. The successful bidder for this task will be required to satisfy the quality criteria.

Major VES components will be fabricated by the successful vendor or vendors for that contract. The bid specifications will include performance and quality criteria appropriate for the component. Detailed design, including drawings and specifications, shall be reviewed and approved by M&E engineers prior to fabrication. Design requirements, including materials and fabrication methods not rigorously identified in the bid documents, shall be reviewed by M&E engineers. Compatibility of materials, maintenance, operation and replacement will be considered. Any changes or substitutions of materials or components in the SVE Operable Unit equipment will be requested of M&E in writing prior to the substitution. M&E will determine if the substitution is appropriate under the application conditions.

Inspections, hold points and testing will be established where appropriate. These will be identified in the bid documents as being part of the contract.

Applicable codes, regulations and standards will be identified in the bid documents. Where not specifically identified in the bid documents, it will be the responsibility of the successful bidder to identify and comply with applicable codes, regulations and standards. All state, county, and local, building and construction codes will be adhered to in the construction of the SVE operable unit.

It shall be the responsibility of the successful bidder to ensure that the item(s) provided satisfy the service intended.

For each component of the SVE Operable Unit, the following will be considered and included, as appropriate, in the bid document:

- Design requirements, including quality assurance requirements, shall be established and incorporated into the design input.
- Acceptance criteria requirements for items, services, or operations shall be identified by the design input to assure that the items, services, and operations conform to the latest applicable requirements.
- Design reviews shall be conducted to verify the design and to provide assurance of the following:

- The drawings and specifications contain the information and operations, including applicable specifications and process requirements, and any inspections or tests (including shop and operational testing) needed to determine conformance.

- That appropriate quality requirements are specified.
- That all applicable regulations and standards are incorporated.
- That the design is indeed adequate to fulfill the specific intent.

· The results of design verification activities shall be clearly documented.

· Significant changes to designs, including field changes, shall be justified and subjected to design control measures commensurate with those applied to the original design and approved by the same affected groups or organization which reviewed and approved the original design documents.

· All authorized changes shall be processed in a manner which will assure their traceability and incorporation at specified effective points.

(7) Procurement Control. Procurement control will be maintained over procurement sources to assure that services and materials conform to specified requirements. Source surveillance and inspection shall be specified in the bid document and performed, as applicable, to assure the required quality of an item, process, or service. Purchase orders (or contracts) shall be controlled to ensure incorporation of pertinent technical and quality requirements, including authorized changes. Specifications and bid documents of major components for procurement will be prepared by M&E for Goodyear and will be issued directly by Goodyear. Subcontracts for successful bidders will be direct through Goodyear following M&E review and evaluation.

(8) Inspection Activities. Measures will be established and documented in the bid documents. Such inspections and tests or evaluations will be performed in accordance with written procedures by appropriately qualified individuals other than those who performed the activity being inspected. The inspection program will encompass, as applicable, inspections and tests performed at a supplier's facility, upon receipt of the material or products, during site preparation and during construction.

Inspection hold points will be identified in appropriate procedures or documents and verification that these hold points were indeed witnessed by the appropriate procedures or documents and verification that these hold points were indeed witnessed by the appropriate individuals will be specified. Inspection results will be recorded on appropriate checklists or other records in hardbound books that can be readily traced to the item inspected and the individual responsible for performing the inspection. The checklist book will consist of inspection items, quality documentation requirements, hold point requirements from each of the SVE Operable Unit component bid documents.

Examples of activities that will be specifically addressed, as applicable, under the inspection activities section of the CQAPjP are as follows:

- Preconstruction Inspection
  - Design/specification review.
  - Familiarization with site conditions.
  - Review of documentation requirements. These documentation requirements include but are not limited to 1) City of Phoenix Building Codes, 2) National Electrical Code, 3) Fire Codes, 4) Maricopa County Air Quality Regulations, 5) ASTM Codes, 6) Noise Ordinances etc.
- Construction Inspection
  - Sampling requirements (per bid document requirements).
  - Testing requirements (per bid document requirements).
  - Visual inspection requirements.
- Post-Construction Inspection
  - Visual inspection requirements.
  - Verification testing requirements.
  - The "punch-list" system.
  - Final inspections.
- Construction Sampling Strategies
  - Type of sampling strategy.
  - Judgmental sampling.
  - Statistical (random) sampling.

- Sample size.
- Sampling locations.
- Sampling frequencies.
- Sampling analysis.

Of particular concern relating to vessels used for the VES system are the integrity of welds; the ability of the vessels to retain their shape and not deform, leak or collapse under the design vacuum applied by the blower; the integrity of the protective epoxy and enamel paint coatings; and the function of protective equipment such as vacuum relief valves.

- Potential vendors will be required to identify the welding method used for vessel welds. Welds will be inspected for appearance, uniformity and thickness.

- Coatings of paint and epoxy are expected to be uniform in thickness and coverage. Drips, splatter, chipping, peeling and cracks are not permissible. Drips and splatter should be cleaned and brought even with other coated surfaces. Chips, peeling and cracks should be sanded to base metal, feathered into the adjoining coating, primed and brought to uniform thickness.

- Vacuum relief valves should be tested for function and calibration. Test results should be provided to M&E for review and inclusion with project QA files.

- Dimension control is important with piping systems. M&E will specify tolerances and require final dimension inspection and documentation where off-tolerance fabrication might adversely affect system performance or erection.

Correct drilling and installation of the operable unit extraction and monitoring wells in Polygon 84 is critical for proper operation of the system. An experienced professional M&E geologist/engineer will oversee all drilling and well installation procedures. Accurate logs of soil type, texture, and contaminant concentrations will be recorded for proper screened zone placement. All measurements of boring depth will be double checked by the geologist. Prior to installing the well, the field geologist will prepare the boring log and consult with the Project Manager for any field changes.

Following the consultation, the boring will be completed as an extraction or monitoring well as required. All well completion will be constructed under the direction of the field geologist by the Drilling Contractor. All materials used for well completion will be approved in lots and individually as required prior to use. These materials include gravel pack, sand pack, sand seal, bentonite chips, bentonite grout, Portland cement grout, and PVC pipe. Any materials not meeting specifications of this document will be rejected for use and will be removed by the Drilling Contractor.

All SVE piping will be installed by a state-licensed general mechanical contractor. Piping activities will be overseen by the Local Technician with remote assistance by M&E. All materials will be lot inspected prior to use. Upon completion of installation, the piping will be pressure tested with the Local Technician's oversight for contract compliance.

(9) Control of Purchased Items and Services. Methods used for the evaluation and/or testing of purchased items or services to assure conformance with the requirements of applicable standards and specifications shall be specified in the bid documents. The disposition of items and services that do not meet procurement document requirements shall also be addressed.

(10) Identification and Control of Items. Adequate methods and appropriate facilities for controlling the identification, handling, and storage of project-specific items and technological data shall be addressed in the bid documents. Data provided by successful bidders to support design, inspections and quality control shall be retained in the M&E project files.

(11) Control of Nonconforming Items. M&E shall review and act on data, facilities, items, materials, services, or activities which do not conform to project requirements as appropriate. M&E will attempt to identify and deal with such items in a timely manner and to resolve such problems in a manner which minimizes project impact. The burden of correction will be placed on the vendor and stated as such in the bid document.

(12) Supplier Selection. Goodyear and M&E will select suppliers via a competitive bid process. While cost and the proven ability to meet schedule will be significant factors, other criteria, as appropriate and including quality, will be considered in the selection process.

The ability of potential suppliers to provide the required facilities, services, or materials will be based on past performance and current business status. Each supplier's quality capabilities shall be periodically evaluated based on performance, by means including audit visits where appropriate.

(13) Control of Measuring and Test Equipment. Vendors shall maintain any calibration measuring devices to directly or indirectly trace assigned values of measurement equipment to values in terms of nationally recognized standards, and shall address assurances that gauges and test equipment, including commercial test items used in acceptance of product, are in a state of proper calibration and maintenance, as appropriate.

The following information shall be included in the bid document to be completed by the supplier as a requirement, as appropriate:

- Reference to the applicable Standard Operating Procedure (SOP) or a written description of the calibration procedure(s) to be used for each applicable piece of equipment
- Planned recalibration frequencies
- Calibration standards to be used and their source(s)
- Documentation requirements
- Use of traceable calibration standards
- Description of recall system

(14) Quality Records. Suppliers are required to maintain sufficient records to furnish evidence of the quality of project-specific facilities, services, items, and activities to satisfy activity specific requirements which are specified in the bid documents. These records shall include the results of reviews, inspections, tests, audits, monitoring of work performance, and materials analysis. Closely related data, such as qualifications of personnel, procedures, and equipment shall also be maintained, as appropriate. It shall also be specified that quality data from all available sources be systematically collected, analyzed, and utilized for the prevention, detection, and correction of deficiencies.

Examples of quality records to be addressed in this section shall include, as appropriate, but not be limited to:

- Qualification/certification documents
- Daily inspection reports
- Test reports
- Final inspection reports
- Acceptance reports
- Process/procedure qualification records
- Performance audit reports
- Systems audit reports
- Nonconformance/corrective action reports

(15) Corrective Action. Conditions adverse to quality are to be promptly identified and corrected. The vendors will be required, by specification or contract, to notify M&E promptly of any adverse conditions relating to quality or which might otherwise affect the project. The cause for the adverse condition shall be reported and corrective action taken. Steps shall be implemented to minimize project impact and to prevent recurrence. As appropriate, bid documents will contain some or all of the following:

- Identification, determination, and correction procedures
- Documentation requirements
- Reporting requirements
- Assignment of corrective action responsibilities
- Corrective action follow-up procedures

(16) Construction Quality Audits. M&E, or its representatives, will be present at the site during erection and startup of the VES system. M&E personnel will assist in startup activities and verify performance of system components. System component performance shall be compared with operating manuals provided by the vendors.

Construction quality audits may be conducted on both a scheduled and/or unannounced basis and shall be performed in accordance with written procedures and checklists by qualified audit personnel who do not have direct responsibility for performing the activities being audited.

Construction quality audit reports, including a requested date for response by the audited organization, shall be distributed to responsible management of both the auditing and audited organizations.

(17) References

1. Consent Decree, 1990, U. S. EPA, Phoenix-Goodyear Airport Superfund Site.

2. Soil Vapor Extraction Final Remedy Consent Decree Design Memorandum and Work Plan, Phoenix-Goodyear Airport (South) Superfund Site, Goodyear, Arizona. January 23, 1992; Revised May 1992.

3. QA/QC Control Guidance for Remedial Activities, Sampling QA/QC Plan and Data Validation Procedures, U. S. EPA, April 1990.

4. A Compendium of Superfund Operating Methods, U. S. EPA, December 1987, PB88-181557.

5. Field Screening Methods Catalogs - User's Guide, September, 1988, U. S. EPA, 540/2-88005.

6. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, U. S. EPA, PB813-170514.

7. Guidance on Oversight of PRP Performed RD/RA, U. S. EPA, OSWER, Directive No. 9355.5-01, 2/14/90. PB90-249707.

8. Field Manual for Resident Representatives and Resident Staff, Metcalf & Eddy, Inc., 1989.

9. Standard Specifications for Public Works Construction, City of Phoenix, Arizona; (Green Book), Document No. 769709, 1988.

9. Regional Standard Drawings, City of Phoenix, Arizona, 1990.

10. National Electric Code, National Fire Protection Association, Quincy, MA, 1990, ISBN-87765-361-5.

APPENDIX D

DRAFT EMERGENCY CONTINGENCY PLAN
(POLYGON 79/94)

CONTINGENCY PLAN

1.0 INTRODUCTION

The Contingency Plan for the Phoenix-Goodyear Airport Soil Vapor Extraction (SVE) operable unit is prepared to protect local communities both residential and commercial in the event that an accident or an emergency should occur.

Due to the nature and design of the SVE operable unit, the Contingency Plan primarily deals with the facility personnel which directly interface with the SVE operable unit. Compliance points for SVE operable unit Contingency Plan monitoring will include air monitoring program and a spill control and countermeasures plan.

A brief description of the subsurface conditions present at the Phoenix-Goodyear Airport are presented as an overview of the required site treatment. A general description for the operable unit is also presented as a primer for the Contingency Plan terminology.

1.1 Subsurface Conditions

Past uses of the Phoenix-Goodyear Airport including maintenance and manufacturing utilized various solvents and cleaning agents as degreasers in the manufacturing and maintenance process. Use of the solvents and cleaning agents throughout the facility resulted in the solvents and cleaning agents being released to the site soils. Infiltration of surface and rainwater into the site soils following the release of the solvents and cleaning agents resulted in downward migration of the solvents to the groundwater table.

Due to the solvent migration, both the soil and groundwater in areas of the site contain levels of solvent contamination that exceed the U.S. EPA maximum contaminant levels. Concentrations of soil vapor in the soil range between 50 µg/L to as high as 9,600 µg/L. Groundwater concentrations range from 5 µg/L (ppbV) to 2,000 µg/L (ppbV). As a result of the soil and groundwater concentrations exceeding the maximum contaminant levels, a remediation program was instituted to remove the contaminants, where required using groundwater and soil vapor extraction. The scope of this Contingency Plan covers the soil vapor extraction (SVE) operable unit. The groundwater extraction operable unit is covered in a separate Contingency Plan under a separate cover.

1.2 SVE Operable Unit

The soil vapor extraction operable unit is designed to remove the residual solvents in the soil in the vapor phase. The process is based on the principle that the solvents have a high vapor pressure and will volatilize from the liquid to the vapor phase under the proper thermodynamic conditions. The soil vapor extraction produces the proper conditions in the soil to promote the volatilization process and remove the solvents in the vapor phase.

The soil vapor extraction system in principle places a vacuum on the soil through a network of wells screened in the solvent-contaminated soil. The wells are connected to a vacuum blower which induces a vacuum on the network of wells and draws the solvent vapors out. As the solvent vapors are drawn out, liquid solvent in the soil volatilizes into the vapor phase and are then removed. Figure D-1 illustrates the configuration of the SVE wells.

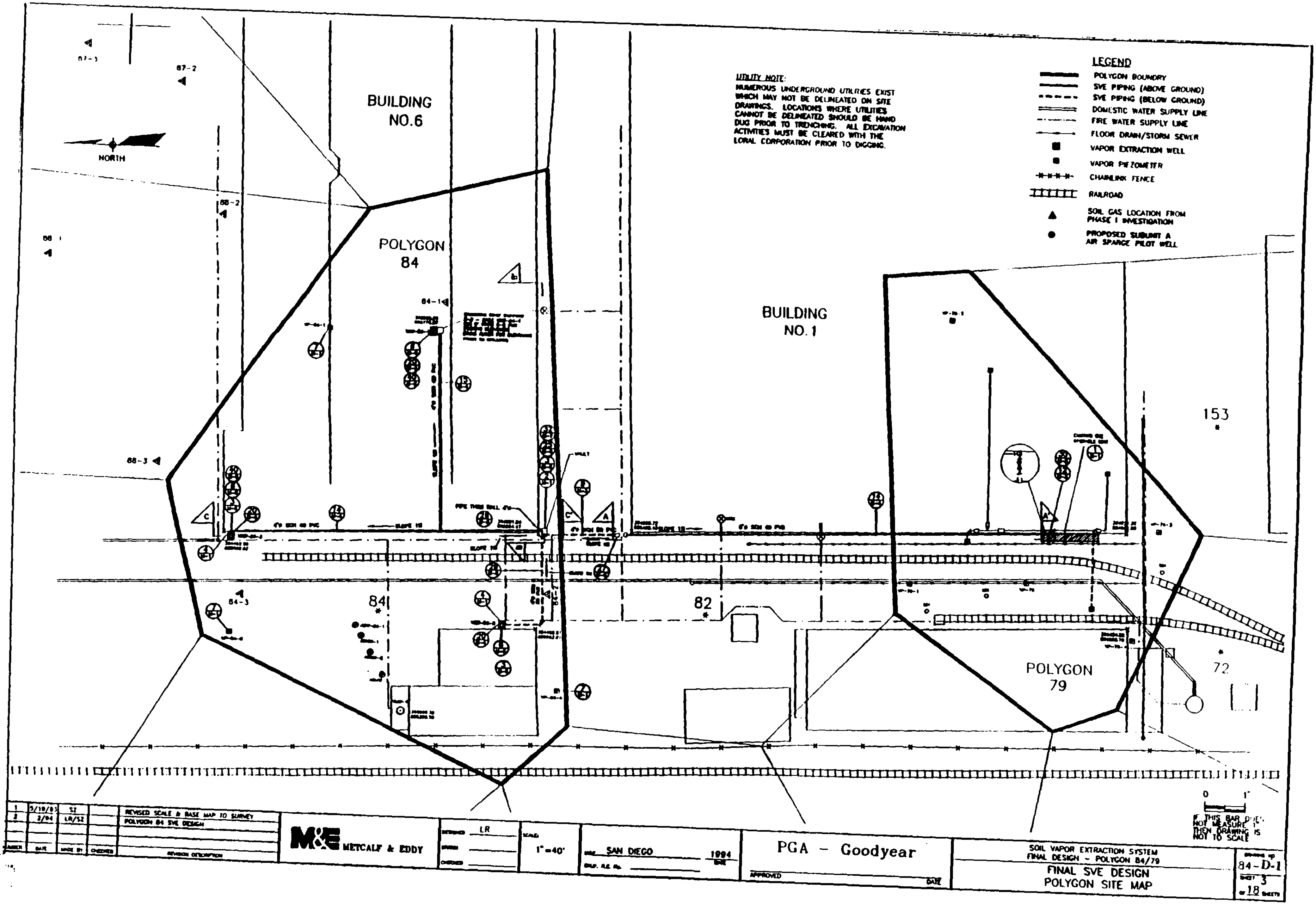
Once the solvent vapors have been extracted, they must be removed from the vapor stream prior to discharge to the atmosphere. The solvent vapors are removed from the air stream through granular activated carbon (GAC) beds. Figures D-2, D-3, and D-4 illustrate the configuration of the SVE operable unit and the individual components.

The solvent-laden air passes through the GAC beds and the solvents are removed. Prior to the solvent-laden air passing through the GAC beds, any entrained water is required to be removed. The water is removed from the solvent-laden air in the air/water separator and is held in the air/water separator reservoir (150-gallon capacity) until a set limit has been reached. At this point, a switch automatically starts a water transfer pump (P-1) which evacuates the water into a 240-gallon water storage tank. A high level water switch in the water storage tank prevents tank over filling. This tank and the air/water separator are the only vessels containing liquids that could be spilled or released to the environment. The water contained in these vessels will be primarily from condensation in the SVE subsurface piping and could contain trace amounts of solvent. Based on previous experience with similar projects, it is anticipated that this water will not exceed greater 50 µg/L total solvents, therefore, it would not be considered an emergency hazard. When the water storage tank is full, it will be transferred via vacuum truck or similar equipment to the Subunit A groundwater treatment system for treatment.

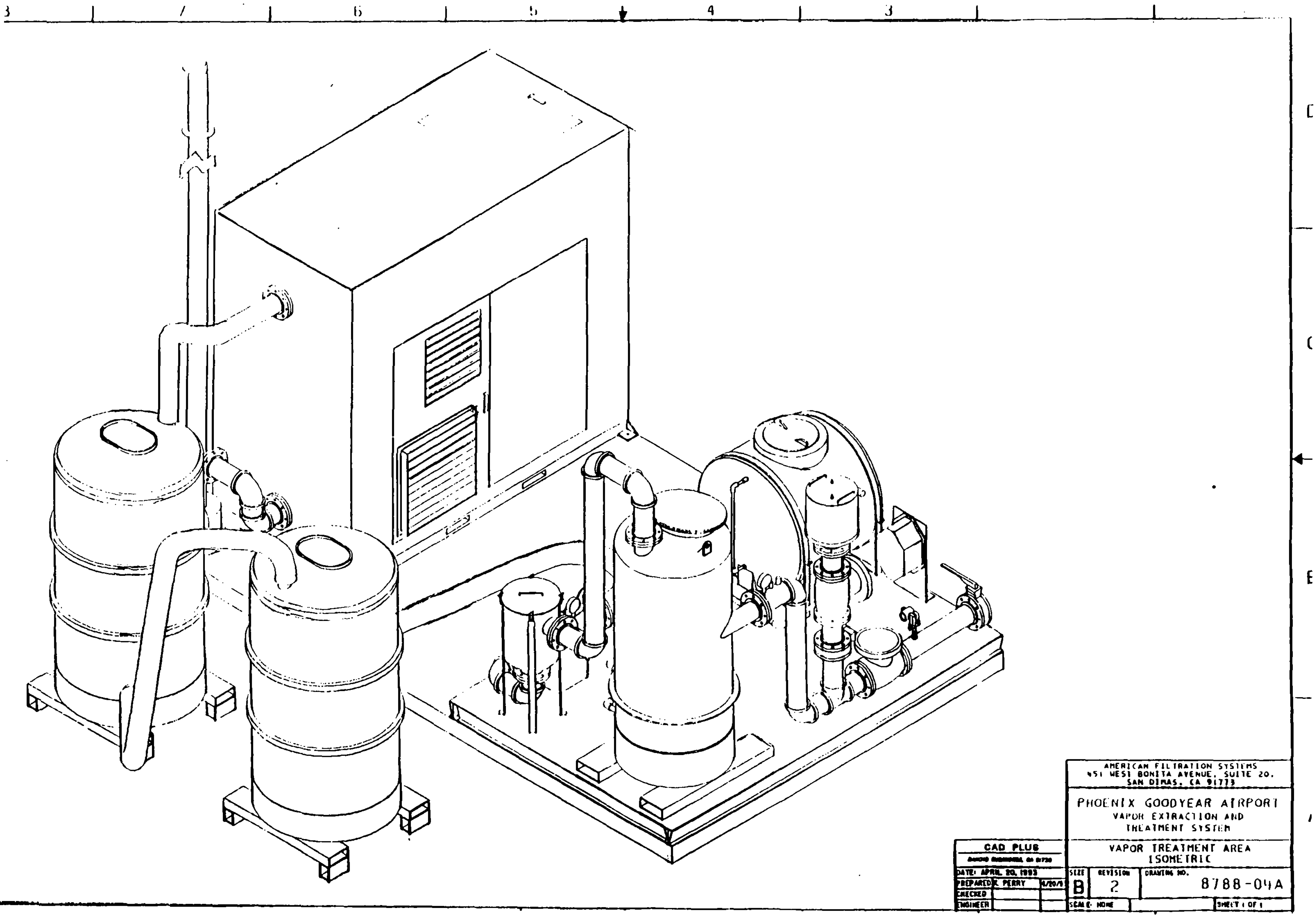
After the solvent-laden vapors pass through the GAC and the solvents are removed, the air then passes through the vacuum blower and is exhausted to the atmosphere via the discharge stack. The entire extraction and treatment system with the exception of the discharge stack and its related piping is under vacuum, resulting in a fail-safe system design with respect to fugitive emissions. Any leaks in the system piping will result in ambient air being drawn into the system rather that solvent-laden air being exhausted to the atmosphere. All piping under positive system pressure has had the solvent vapors removed.

The only opportunity for discharge of solvent-laden air to the atmosphere is if the GAC units are expended and the solvents are not removed. This scenario is minimized through the installation of a continuous on-line solvent vapor monitor in the discharge of the primary GAC bed. Detectable levels of solvents in the air effluent from the primary GAC bed will result in system shut-down and GAC regeneration and/or changeout. The Maricopa County discharge regulations were used to set this limit at 10 ppmV as TCE.

As an added precaution against solvent breakthrough of the GAC and discharge to the atmosphere, a secondary GAC bed has been installed in series with the primary GAC. Should the primary GAC breakthrough, the secondary GAC, the same size as the primary, will assure that the treatment system remains within the permitted discharge allowances. Upon carbon changeout, the secondary GAC will be used as the primary GAC, thus enabling the fresh GAC to provide solvent discharge protection in the event of primary GAC breakthrough. Lastly, the entire treatment

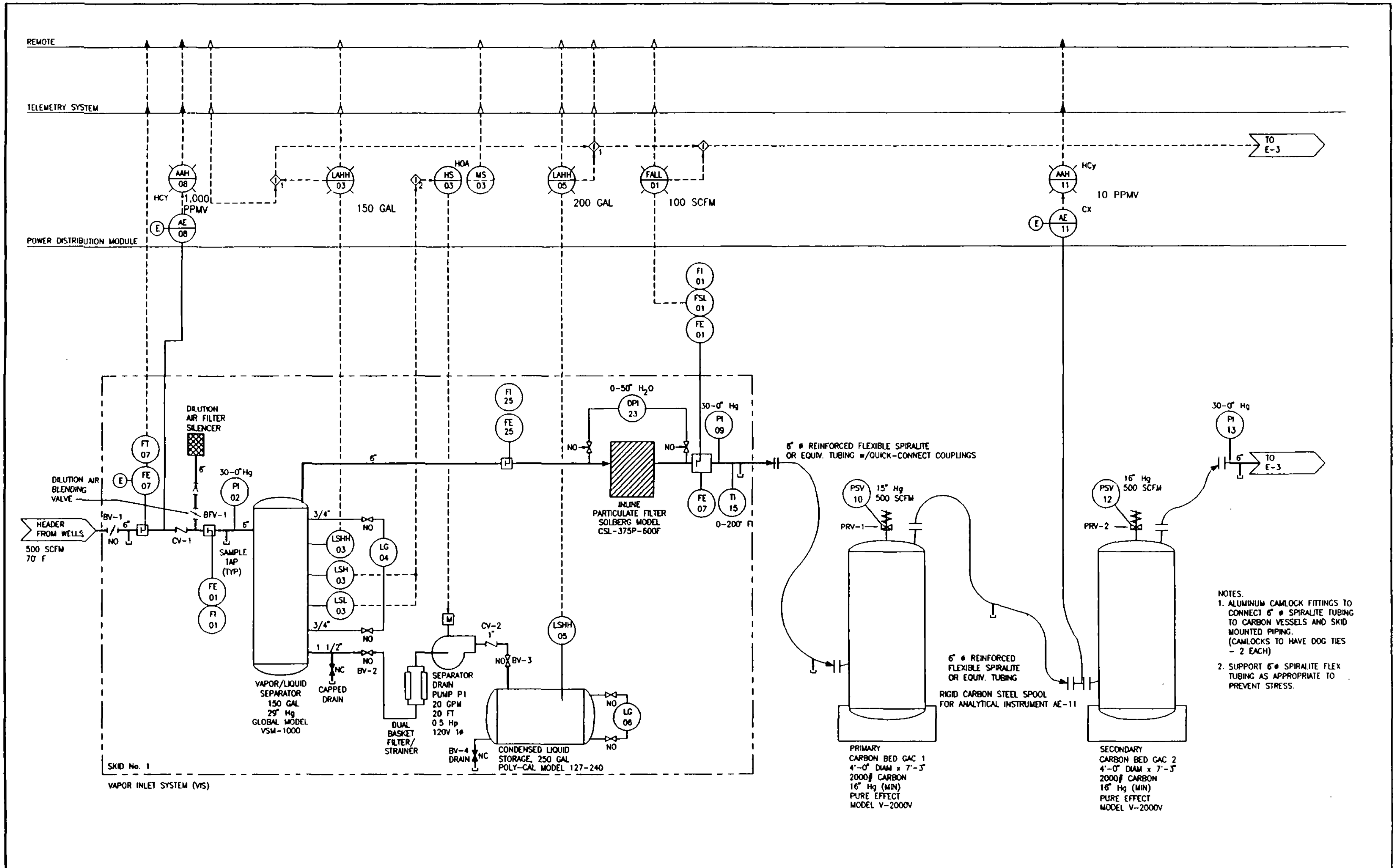


BUILDING NO.6
NORTH
POLYGON 84
BUILDING NO.1
POLYGON 79
153
84
82
72
87-3
87-2
88-2
88-1
88-3
84-1
84-3
UTILITY NOTE:
NUMEROUS UNDERGROUND UTILITIES EXIST WHICH MAY NOT BE DELINEATED ON SITE DRAWINGS. LOCATIONS WHERE UTILITIES CANNOT BE DELINEATED SHOULD BE HAND DUG PRIOR TO TRENCHING. ALL EXCAVATION ACTIVITIES MUST BE CLEARED WITH THE LORAL CORPORATION PRIOR TO DIGGING.
LEGEND
POLYGON BOUNDRY
SVE PIPING (ABOVE GROUND)
SVE PIPING (BELOW GROUND)
DOMESTIC WATER SUPPLY LINE
FIRE WATER SUPPLY LINE
FLOOR DRAIN/STORM SEWER
VAPOR EXTRACTION WELL
VAPOR PIEZOMETER
CHAINLINK FENCE
RAILROAD
SOIL GAS LOCATION FROM PHASE I INVESTIGATION
PROPOSED SUBUNIT A AIR SPARGE PILOT WELL
0 1"
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE
1 5/19/93 SZ REVISED SCALE & BASE MAP TO SURVEY
2 3/94 LR/SZ POLYGON 84 SVE DESIGN
NUMBER DATE MADE BY CHECKED REVISION DESCRIPTION
M&E METCALF & EDDY
DESIGNED LR
DRAWN
CHECKED
SCALE 1"=40'
SAN DIEGO 1994
PGA - Goodyear
APPROVED DATE
SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN - POLYGON 84/79
FINAL SVE DESIGN
POLYGON SITE MAP
84-D-1
SHEET 3 of 18 SHEETS



AMERICAN FILTRATION SYSTEMS
451 WEST BONITA AVENUE, SUITE 20,
SAN DIMAS, CA 91773
PHOENIX GOODYEAR AIRPORT
VAPOR EXTRACTION AND
TREATMENT SYSTEM
VAPOR TREATMENT AREA
ISOMETRIC
CAD PLUS
DATE: APRIL 20, 1993
PREPARED R. PERRY
CHECKED
ENGINEER
SIZE B
REVISION 2
DRAWING NO. 8788-04A
SCALE: NONE
SHEET 1 OF 1

Figure D-2



NUMBER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION
1	3-22-93			ELEC. PER MFG. CHANGE
2	10-20-93			CHANGES FOR RECORD DRAWING
3	2-94	SZ		POLYGON 84 DESIGN

M&E METCALF & EDDY

DESIGNED / DRAWN / CHECKED

SCALE: NONE

SAN DIEGO, CA — 1994 — DATE

CALIF. R.E. No.

PGA - Goodyear

APPROVED — DATE

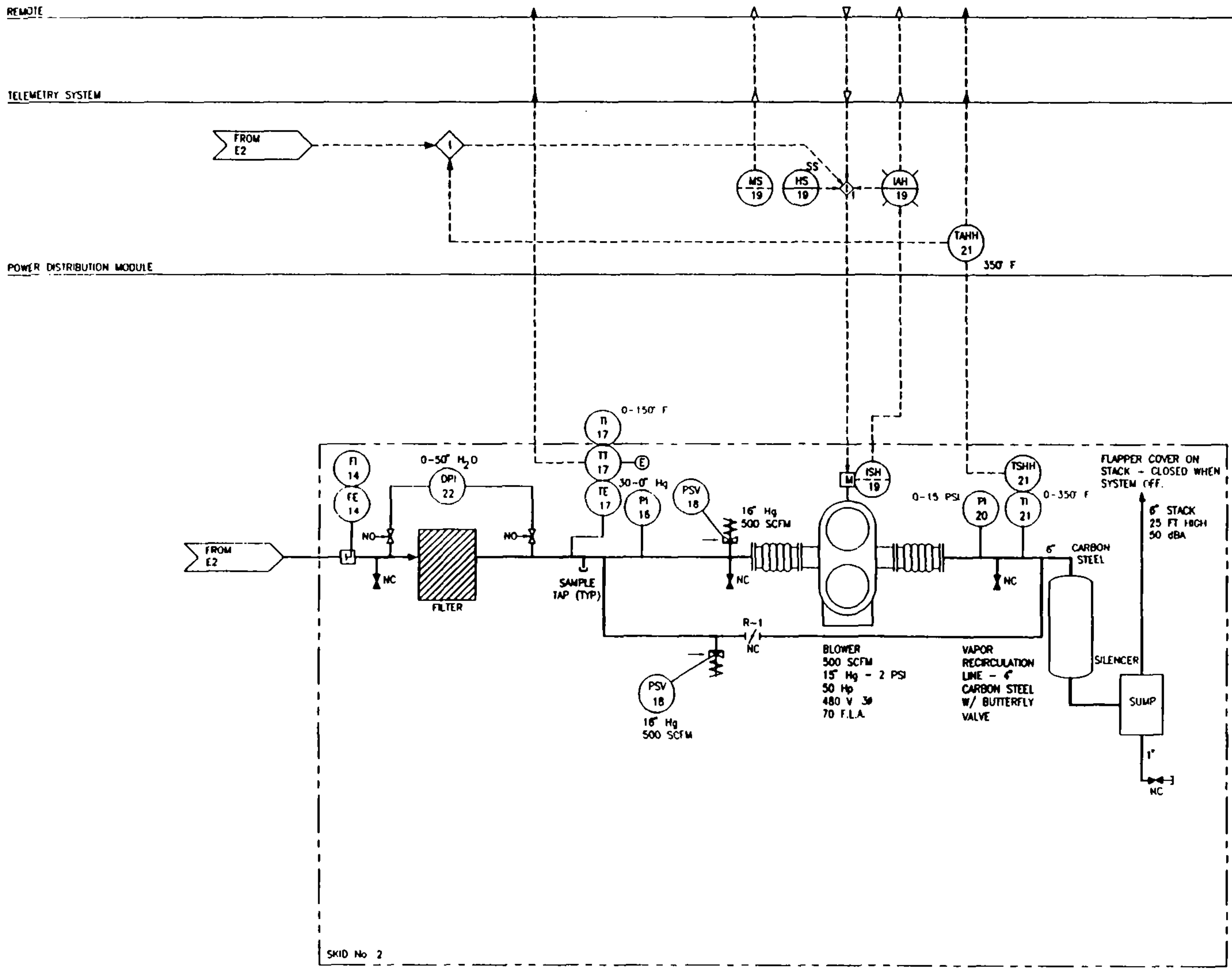
SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN - POLYGON 84/79

PROCESS & INSTRUMENTATION DIAGRAM 1

DRAWING NO. 84-D-3

SHEET 14 of 18 SHEETS

GYT84E-2



INTERLOCK NOTES:

◇1 LOCK OUT BLOWER WITH MANUAL RESET ON LOW FLOW FROM WELLS, HIGH-HIGH LEVEL IN AIR/WATER SEPARATOR, HIGH-HIGH LEVEL IN CONDENSED LIQUID TANK, BLOWER OVERLOAD, OR BY TELEMETRY

◇2 START CONDENSATE TRANSFER PUMP ON HIGH LEVEL IN AIR/WATER SEPARATOR, STOP PUMP ON LOW LEVEL IN AIR/WATER SEPARATOR

NOTE: ALL COMPONENTS SHOWN WITH EXCEPTION OF STACK AND SUMP MOUNTED ON CARBON STEEL BOX-TUBE SKID W/FORKLIFT OR CRANE LIFTING POINTS

NUMBER	DATE	MADE BY	CHECKED	REVISION DESCRIPTION
1	3-22-93	IB		ELEC PER MFG. CHANGE
2	10-26-93	IB		CHANGES FOR RECORD DRAWING
3	2-94	S2		POLYGON 84 DESIGN

M&E METCALF & EDDY

DESIGNED ____ DRAWN ____ CHECKED ____

SCALE: NONE

SAN DIEGO, CA — 1994 DATE

CALIF. R.E. No. ____

PGA - Goodyear

APPROVED ____ DATE

SOIL VAPOR EXTRACTION SYSTEM
FINAL DESIGN - POLYGON 84/79

PROCESS & INSTRUMENTATION DIAGRAM 2

DRAWING NO. 84-D-4
SHEET 15 of 18 SHEETS

system is connected directly to a telemetry unit which can be accessed by M&E computers at any time of the day or night via telephone lines. In the event of an alarm condition, the telemetry will automatically dial the Emergency Response Parties to alert them of the condition and will record the condition of the emergency.

The following sections of this Contingency Plan highlight the personnel and actions necessary to protect populations around the SVE operable unit when in operation.

2.0 EMERGENCY RESPONSE PARTY

The SVE operable unit has been designed with safety as a primary concern. In the event that an emergency condition arises, the system telemetry unit will automatically dial the Emergency Response Parties for prompt response. Two parties have been listed to respond to system emergencies. The first party is for immediate response to evaluate the condition of the system emergency and determine if the system engineers are required to respond. Response time for the first party during standard working hours is less than two hours. All conditions at the time of the emergency until on-site response will be recorded by the system telemetry unit.

The second response party is the system engineers, or Metcalf & Eddy, Inc. M&E will respond to the system condition within 24 hours of the emergency condition if deemed necessary by consultation between the first response party and M&E.

2.1 First Response Party

Bartholomew Engineering
4120 N. 20th Street
Phoenix, Arizona 85016
Mr. Richard Bartholomew
(602) 957-0208
(602) 440-5543 (pager)

2.2 Second Response Party

Metcalf & Eddy, Inc.
450 B Street, Suite 1900
San Diego, California 92101
Scott P. Zachary
(619) 233-7855
(619) 531-7622 (pager)
(619) 229-0170 (home)

3.0 OVERSIGHT NOTIFICATION

Due to the type of system and fail-safe nature of operation, notification of federal, state, and local agencies is not anticipated. If a system emergency should require oversight notification, the following agencies will be notified within 24 hours of the emergency for response.

3.1 Local Site Representative

Loral Corporation
3200 S. Litchfield Road
Goodyear, Arizona 85338
Mr. Tom Heim/Mr. Randy Clark
(602) 925-7102/-7274

3.2 State Site Representative

Arizona Department of Environmental Quality
3033 N. Central Avenue, Suite 400
Phoenix, Arizona 85012
Mr. Jim Kasarskis
(602) 207-4218

3.3 Federal Site Representative

United States Environmental Protection Agency
Superfund Enforcement Branch (H-7-2)
75 Hawthorne Street
San Francisco, California 94105-3901
Mr. Craig Cooper
(415) 744-2370

3.4 Emergency Squad

City of Goodyear Fire Department
S. Litchfield Road
Goodyear, Arizona 85338
(602) 932-3050

American Ambulance
1401 E. Washington St.
Phoenix, Arizona
(602) 253-1492

Lifeflite Air Ambulance
(602) 985-2873

Good Samaritan Hospital
51st Street and Campbell Ave.
Phoenix, Arizona
(602) 239-2000

3.5 System Owner/Operator

Goodyear Tire & Rubber Company
1144 E. Market Street
Akron, Ohio 44316
Mr. Mark Whitmore
(216) 796-3863

Appendix G, the Health and Safety Plan, contains more complete information with respect to emergency numbers and directions for personnel health and safety.

4.0 FIRST AID/MEDICAL RESPONSE

Due to the nature of the SVE system, it is anticipated that any need for medical response will be needed in the construction phase of the project. The hazards as well as the responses for accidents during the construction phase of the project are discussed in detail in the Health & Safety Plan (Appendix G). If an emergency should arise that requires first aid or medical attention, the following parties should be contacted or utilized.

4.1 First-Aid Trained Personnel

Randy Clark, Loral Corporation
(602) 925-7101 (Phoenix)

Richard Bartholomew, Bartholomew Engineering
(602) 957-0208 (Phoenix)

Scott P. Zachary, Metcalf & Eddy, Inc.
(619) 233-7855 (San Diego)

David Springer, Metcalf & Eddy, Inc.
(805) 962-2122

4.2 Medical Facilities

In the event that an emergency should arise, **dial 911** for assistance. Medical facilities are:

American Ambulance
1401 E. Washington St.
Phoenix, Arizona
(602) 253-1492

Lifeflite Air Ambulance
(602) 985-2873

Good Samaritan Hospital
51st Street and Campbell Ave.
Phoenix, Arizona
(602) 239-2000

4.3 Fire/Rescue/Emergency Response Teams

In the unlikely event that a fire or emergency should develop in or around the operable unit, **911** should be called in an immediate emergency. All other cases, the following response parties should be contacted for response as required.

City of Goodyear Fire Department
Yuma Road at Litchfield
Goodyear, Arizona 85338
(602) 932-2300

Poison Control Center
Good Samaritan Hospital
(602) 253-3334 or (602) 239-2000

Explosives Unit
Phoenix Fire Department
(602) 262-6771

CHEMTREC Emergency Response
1-800-242-9300

EPA ERT Emergency Hotline
(201) 321-6660

5.0 AIR MONITORING PLAN

The Air Monitoring Plan for the treatment system consists of monitoring the area around the extraction and treatment operable unit with a hand-held vapor analyzer as outlined in detailed in the Health & Safety Plan (Appendix G).

Due to the nature of the operation of the extraction and treatment operable unit, failures in the piping or other components of the system would not result in releases of contaminants to the atmosphere, but rather will result in ambient air being drawn into the treatment system. As a result of this design, no fugitive emissions are expected to result which would require monitoring. The system will conform at all times during operations to the air discharge conditions of Maricopa County, and therefore, will not result in a personal exposure problem.

To demonstrate compliance with the conditions in the Air Discharge conditions of Maricopa County, M&E has installed a continuous on-line hydrocarbon vapor analyzer in the treatment system piping to assure that the discharge limits are being met. Refer to Appendix F, System Construction/Operation Permits and for the Air Permit specifications and Appendix G, the Health & Safety Plan, for the personal work space monitoring specifics.

Should the treatment system and safety controls fail, a concentration of 4 ppmV at a flow rate of 500 scfm in the stack exhaust would trigger the Contingency Plan operations. This level is based on 50 percent of the Maricopa County risk-based discharge limit of 4 pounds of TCE discharge per day with the operable unit operating at 500 scfm. Because the concentrations in the site subsurface are low, and two GAC units operate in series to protect against unplanned emissions, this discharge level is not anticipated to be reached and should not trigger the Contingency Plan.

6.0 SPILL CONTROL AND COUNTERMEASURES PLAN

The soil vapor extraction operable unit is designed primarily as a vapor conveyance system. No hazardous liquids are handled directly by the operable unit and therefore does not require a formal Spill Control and Countermeasures Plan.

Operation of the system does however have the potential of generating small amounts of liquid in the form of condensate from the subsurface piping network. This entrained condensate liquid in the air stream is removed with the air/water separator. Once the water has been separated, it collects in the 150 gallon reservoir of the air/water separator. When the water in the reservoir reaches a set level, a pump (P-1) is activated that transfers the water in the reservoir to a 240-gallon storage tank. The air/water separator, water transfer pump, and the 250 gallon water storage tank is located on skid number 1. See Appendix A, Draft Plans and Specifications for the skid configuration.

It is anticipated that the water collected in the air/water separator will contain only trace levels of the solvent contaminants. Due to the non-hazardous nature of this water, spill containment around the air/water separator is not required. Should a leak in the system piping occur, the system will be immediately shut down and the leak will be repaired. Water stored or collected in the air/water separator and 240-gallon storage tank will be transferred via a suction pump to a vacuum truck mobile trailer. The water, once transferred to the truck or trailer will be transported to the site Subunit A groundwater treatment system where it will be treated prior to discharge.

Spills or releases from the system will be minimized through the ongoing operable unit Operation and Maintenance Plan (November 5, 1993). All vessel and pump piping and fittings will be checked on a regular basis for integrity and tightness. Any fittings found to be loose will be tightened, and any fittings found to be sub-standard will be promptly replaced. In the event that a water release should occur, the following parties will respond to evaluate the need for additional emergency measures.

First Response Party:

Bartholomew Engineering
4120 N. 20th Street
Phoenix, Arizona 85016
Mr. Richard Bartholomew
(602) 957-0208
(602) 440-5543 (pager)

Second Response Party:

Metcalf & Eddy, Inc.
450 B Street, Suite 1900
San Diego, California 92101
Scott P. Zachary
(619) 233-7855
(619) 531-7622 (pager)

In the event that a water release does occur, the water from the release will be tested to determine if any contaminants are present. If contaminants are present, any soils surrounding the operable unit in the immediate release area will be excavated and moved to the soil residuals staging area immediately southwest of the Subunit A treatment system (see Section 5 of this report).

Due to the negligible to trace levels of contaminants expected to be present in the air/water separator condensate water, a local contractor will be used to excavate and move any soil if deemed necessary. Two potential contractors that could perform the work include:

Anderson Contracting Co., Inc.
11030 No. 21st Avenue
Phoenix, Arizona
(602) 943-7214

The Weber Group, Inc.
16825 So. Weber Drive
Chandler, Arizona
(602) 961-1141

Each of these contractors are OSHA certified for hazardous materials site operations and will conduct all work in compliance with the site Health & Safety Plan and all other pertinent sections of this report. All spill countermeasures work conducted on site will be overseen by Metcalf & Eddy, Inc., the Goodyear Tire and Rubber Company, and the U.S. EPA.

APPENDIX E

SVE OPERABLE UNIT DRAFT EASEMENTS
(POLYGON 79/84)

APPENDIX E

SVE OPERABLE UNIT DRAFT EASEMENTS

Goodyear has previously contacted the appropriate landowners or parties leasing facilities at the Phoenix-Goodyear Airport for the purpose of operating the U.S. EPA-approved Soil Vapor Extraction (SVE) operable unit, which is currently in place in Polygon 79. The operable unit will be used to treat soil vapor from Polygon 84 (and Polygon 79 if required) which will be conveyed to the treatment unit via three proposed extraction wells and proposed lateral and header piping.

The proposed Polygon 84 installation is to include but not be limited to the installation of the following items:

- Soil vapor extraction wells
- Soil vapor monitoring wells
- Soil vapor extraction well subsurface piping
- SVE system aboveground/overhead piping

The individual parties which have been previously contacted with respect to obtaining easements for the Polygon 79 SVE operable unit include:

1. City of Phoenix

   a. Phoenix-Litchfield Municipal Airport
   b. City of Phoenix Office of Environmental Programs

2. Loral Defense Systems

3. Southern Pacific Railroad

4. City of Goodyear Building Department

It is not necessary to again contact all of the above-listed parties with regard to the continued operation of the SVE unit at Polygon 79 for the treatment of soil vapor from Polygon 84. The only required notification for Polygon 84 pertains to the proposed installation of vapor extraction wells and subsurface and aboveground piping. Written approval will be obtained from Loral Defense Systems (Property Owner) prior to commencing these installations in accordance with the requirements outlined in Table E-1. Draft easement requirements of the other three parties listed above are also highlighted in Table E-1.

Preliminary meetings have been held between Goodyear, Loral Defense Systems, and CAVCO, the current land/building tenant with respect to the installation of SVE wells and piping for Polygon 84.

TABLE E-1
SVE - PHOENIX - GOODYEAR AIRPORT

LAND OWNER CONTACTS AND SITE WORK REQUIREMENTS
SEPTEMBER 2, 1992, BY: RICHARD F. BARTHOLOMEW, P.E.

PARTIES CONTACTED	ADDRESS AND TELEPHONE	SUMMARY OF CONTACT DISCUSSION	CONSTRUCTION REQUIREMENTS
City of Phoenix Charles Boyer - Airport Mgr. Cynthia Parker -Aviation Env. Eng. Don Stoltzfus- Aviation Env. Geologist	Boyer, Admin. Bldg Phoenix-Litchfield Municipal Airport 1658 S. Litchfield Rd Goodyear AZ 85338 Boyer (602) 932-1200 Parker City of Phoenix Aviation Dept. 3400 Sky Harbor Blvd. Phoenix AZ 85034-4921 (602) 273-2730 Stoltzfus City of Phoenix Office of Environmental Programs 251 W. Washington St. Phoenix AZ 85003 (620) 256-5669	Discussed location of SVE wells and pipe collection systems	1. Plans for work must be approved before work starts. 2. Street surfaces, runway areas and other work areas must be restored to original conditions. 3. No major runways or taxiways can be open cut. 4. FAA must be notified of any work within flight area. 5. Permanent easements for constructed items must be secured. 6. Must follow all City of Phoenix construction standards for street and related repairs.
Loral Defense Systems Tom Helm - Dir. of Fac. Engineering Randy Clark - Environmental Engineer	Loral Corporation 1300 S. Litchfield Road Goodyear AZ 85338 mail: P.O. Box 805 Litchfield Park AZ 85340 Helm (602) 925-7102 Clark (602) 925-7274	Discussed SVE Plant locations, Pipeline Collection System	1. Plans for work must be approved before work starts. 2. Surface areas in work area must be restored to original condition. 3. Permanent easements for constructed items must be secured plus access agreement.
Southern Pacific Railroad John Ivanunich - Mgr. of Contract Dept	Southern Pacific Railroad 1200 Corporate Center Monterey Park CA 91754 (213) 780-6957	Discussed RR easement requirements	1. Overhead crossing must have 23' clearance above railroad track. 2. Side structures must be at least 10' away from edge of tracks. 3. Plans for crossing must be approved prior to work start. 4. Easemnts for crossing must be obtained before work starts.
Lufthansa Airlines Training Ctr. Irmgard Bueschegen -Head of Admin. *Note: Lufthansa leases property from City of Phoenix	Lufthansa Airline Training Ctr 1858 S. Litchfield Rd Goodyear AZ 85338 (602) 932-1600	Discussed SVE wells (Polygon 92) and collection pipe system	1. Plans must be approved prior to work starting. 2. All work surface areas must be restored to original conditions. 3. Contractor to notify Lufthansa, 48 hours before working in parking or traffic area requiring any barricades or traffic detours.

nve.tab

A main railroad crossing is not required for the installation of the SVE wells or piping in Polygon 84, however a railroad service spur on Loral property will be required to be crossed by a single subsurface vapor extraction header. Goodyear will work with Loral Defense Systems to obtain the permits for this spur crossing.

In obtaining all property easements, all property owners or renters will be notified of the intent and will be informed that all state, county, and local building codes will be upheld in the construction process.

Refer to Appendix F for system permitting and Appendix A for the SVE operable unit draft plans and specifications.

APPENDIX F

DRAFT SYSTEM OPERATION/CONSTRUCTION PERMIT APPLICATIONS

In accordance with Section VII, Subsection D-8 of the 1990 Consent Decree, permit requirements for the operation of the Soil Vapor Extraction (SVE) operable unit are discussed herein.

The primary permit required for the operation of the SVE operable unit is a Maricopa County Air Discharge Permit. Due to the fact the PGA site falls under the jurisdiction of U.S. EPA (Region IX) as a superfund site, an exemption from the formal Maricopa County Air Discharge permit was granted for the treatment unit. However, the SVE operable unit is operated in compliance with Maricopa County air discharge regulations. Compliance with County standards is monitored through continuous emissions monitoring.

A permit from the Federal Aviation Administration was not deemed necessary due to the fact that Polygon 84 is not within any flight paths.

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GLOSSARY

ANSI	-	American National Standards Institute
APR	-	Air Purifying Respirator
ACGIH	-	American Conference Of Governmental Industrial Hygienists
CFR	-	Code Of Federal Regulations
CGI	-	Combustible Gas Indicator
CLEAN ZONE	-	Support Zone
CSEP	-	Confined Space Entry Permit
DECON	-	Decontamination
ERCS	-	Emergency Response Clean-up Services
ERT	-	Emergency Response Team
HNU-PID	-	HNu Photoionization Detector
HOT ZONE	-	Exclusion Zone
FID	-	Flame Ionization Detector (See OVA)
IDLH	-	Immediately Dangerous To Life & Health
MREM/HR	-	Milli-Roentgens Equivalent In Man Per Hour
NIOSH	-	National Institute For Occupational Safety & Health
OSC	-	On-scene Coordinator
OSHA	-	Occupational Safety And Health Administration
OVA	-	Organic Vapor Analyzer (FID survey meter)
PEL	-	Permissible Exposure Limit (OSHA Reg., Enforceable by law)
PPE	-	Personal Protective Equipment
PPM	-	Parts Per Million
RM	-	Response Manager
SCBA	-	Self-contained Breathing Apparatus
SOP	-	Standard Operating Procedure
SPCC	-	Spill Prevention Controls & Countermeasures
TAT	-	Technical Assistance Team
TLV	-	Threshold Limit Value (ACGIH Recommendation)
TWA	-	Time Weighted Average
U.S. EPA	-	United States Environmental Protection Agency

SITE HEALTH AND SAFETY PLAN

Phoenix-Goodyear Airport Site
Installation of Soil Vapor Extraction System

1.0 GENERAL INFORMATION

Metcalf & Eddy (M&E) has modified the existing Health & Safety Plan (HSP) for the Phoenix-Goodyear Airport (PGA) site. The original HSP was prepared by ICP Technology Incorporated, Universal City, California and Bartholomew Engineering, Phoenix, Arizona. The modifications update the existing HSP to include the installation of the Soil Vapor Extraction System. Only this modified HSP should be referenced to cover tasks under the new work order.

This plan contains general health and safety information related to the performance of remedial activities at the PGA site. The work is to be conducted at the Phoenix-Goodyear Airport located in the City of Goodyear, Arizona.

The remedial activities will include construction and installation of a Soil Vapor Extraction System (SVES), soil gas survey and soil borings. Additionally, vapor extraction wells and Vadose Zone piezometers will be monitored using vacuum gauges and sampling instruments. This monitoring will be conducted to determine the SVES influence on surrounding media.

Based on the information available, the overall hazard for performance of the work under this plan is low. The chemical contamination found at the site is primarily confined to the aquifer with limited surface contamination. The primary chemical hazard found at the site is trichloroethylene (TCE) in the ground water beneath the site. While there is a potential for exposure to TCE in soil, no volatile compounds have been detected in the air during previous field activities. Soil and ground water contaminated with chromium and cadmium have been identified, but are confined to the Goodyear Aerospace Corporation (GAC) Sludge Drying Beds.

Procedures identified in this plan adhere to accepted industry standards and applicable Federal and State regulations.

1.1 INTRODUCTION

This document describes the health and safety guidelines developed for the Phoenix-Goodyear Airport in Goodyear, Arizona. The HSP is developed to protect on-site personnel, visitors, and the public from physical harm and exposure to hazardous materials or waste. The procedures and guidelines contained herein were based upon the best available information at the time of the plan's preparation. Specific requirements will be revised when new information is received or conditions change. Any amendments to this plan will be included in Appendix E. Where appropriate, specific OSHA standards or other guidelines will be cited and applied.

This HSP will provide:

- Policy statements on the line of authority and accountability for implementing the program, the objectives of the program, and the role of site safety and health officer or manager and staff;
- Information for the development of procedures for identifying and controlling workplace hazards at the site;
- Information for the development and communication to site workers of the various plans, work rules, standard operating procedures (SOPs) and practices that pertain to individual employees and supervisors;

- Requirements and information for the training of supervisors and employees to develop needed skills and knowledge to perform their work in a safe and healthful manner;

- Guidance to anticipate and prepare for emergency situations, and

- Tools for information feedback to aid in evaluating the program and for improving the effectiveness of the program.

1.2 OBJECTIVES

This HSP provides general procedures to be followed during the construction activities at the PGA site. To insure the health and safety of field personnel, work conducted at the site will be performed in accordance with the procedures outlined in this plan. This HSP has been designed to meet the following objectives:

- To describe the known physical and chemical hazards and evaluate the associated risks;

- To define personnel responsible for the implementation and oversight of the health and safety procedures described herein;

- To provide general work rules pertinent to field work;

- To define work zones, respective safety procedures, and levels of protection;

- To define medical monitoring, equipment and personnel decontamination procedures;

- To define field monitoring procedures and their use in establishing levels of protection;

- To define emergency procedures for physical injury, chemical exposure, explosion, and fire incidents;

- To define the documentation requirements for Health and Safety Plan implementation;

- To provide background data and information on the chemical and toxicological properties of known and suspected contaminants; and

- To provide control procedures to prevent uncontrolled access to the work areas by unauthorized personnel.

All field work shall be performed in compliance with the U.S. Occupational Safety and Health Administration (OSHA) standard for Hazardous Waste Operations and Emergency Response (20 CFR Part 1910). Additional publications which should be consulted and complied with are the EPA Standard Operating Guidelines, as well as the NIOSH/OSHA/EPA/USCG Occupational Safety and Health Guidance manual for Hazardous Waste Site Activities. Health and safety considerations at the PGA site include exposure to chemicals and physical hazards associated with field operations.

This HSP is designed to protect personnel against:

- Direct skin contact with chemicals that may be present in surface/subsurface soils, ground and surface waters, and source areas;

- Inhalation of harmful levels of organic vapors and contaminated particulates, and

- Physical, mechanical, and biological hazards that may be encountered, including heat/cold stress.

1.3 GENERAL SAFETY REQUIREMENTS:

The following general safety procedures shall be followed by all persons entering and/or working on the site:

a. All persons involved in this project shall read and sign this Health & Safety Plan prior to entering or working on the site. The master copy (with signature sheet) of this Safety Plan will be held by the designated on-site Safety Officer. A signature sheet is provided in Appendix B of this plan.

b. No employee or subcontractor may be allowed on-site without the prior knowledge and consent of the site Health & Safety Officer.

c. There will be no activities conducted on-site without sufficient backup personnel to permit operation of a buddy system. At a minimum, two persons must be present at the site. Visual, voice or radio communication will be maintained at all times.

d. All contractor or subcontractor personnel shall bring to the attention of the site Health & Safety Officer or resident project representative any unsafe condition or practice associated with the site activities.

e. There will be no smoking, eating, chewing gum, drinking or application of cosmetics in any exclusion zone.

f. Hands, face and all other potentially contaminated areas shall be thoroughly cleaned prior to smoking, eating or other activities subsequent to egress from an exclusion zone.

g. Team members must avoid unnecessary contamination (i.e., walking through known or suspected "hot" zones or contaminated puddles, kneeling or sitting on the ground, leaning against potentially contaminated barrels or equipment).

h. Close-fitting respirator facepieces may not be worn with beards, long sideburns, or other conditions that prevent a proper seal.

i. No contact lenses may be worn within an exclusion zone".

j. All boring, excavation, heavy equipment operation, and general construction activities shall be performed in compliance with 29 CFR 1926.

k. All project personnel who are likely to wear air purifying or air supplied respirators must first meet the training and medical requirements of 29 CFR 1910.120 and 29 CFR 1910.134.

l. Aerial obstructions such as power lines and tree branches will be verified prior to erection of drill rig masts or movement of large equipment. A 20 foot horizontal clearance must be maintained between all aerial obstructions.

m. Locations of subsurface utilities and buried bulk wastes shall be verified prior to any drilling or excavation activities.

n. All accidents and/or injuries shall be immediately reported to the site safety officer. If necessary, a first report of injury will be initiated by the site safety officer and provided to the Regional Safety Officer for processing.

1.4 PROJECT ORGANIZATION

For this project, M&E will designate a Site Safety Officer (SSO) who will be responsible for the health and safety of all their on-site personnel including any subcontractors working for them on the site. The SSO will monitor site activities and evaluate whether the provisions of the HSP are being implemented. Individuals with appropriate experience, designated by the SSO, will be responsible for day-today site health and safety concerns when the SSO is not on-site.

The SSO, or designee, has the following responsibilities under this HSP:

- Instruct site personnel in the provisions of this HSP and in work practices necessary for continuous health and safety during all aspects of field work;
- Advise site personnel of the emergency contacts and location of the nearest appropriate hospital;
- Verify that site personnel are aware of the potential hazards associated with the site and specific activities;
- Conduct periodic air monitoring and specify levels of protection based on results;
- Regularly check that appropriate personnel protective equipment, clothing, first aid, and decontamination equipment are available and being properly used;
- Ensure that site activities, kick-off meetings, and safety briefing are conducted as necessary; and
- Provide written documentation to the Program Health & Safety Officer (PHSO) on the steps taken above.

2.0 SITE BACKGROUND

2.1 FACILITY DESCRIPTION

The Phoenix-Goodyear Airport (PGA) site is situated in the City of Goodyear, approximately 20 miles west of Phoenix, Arizona, as shown in Figure 1. In 1985, the combined population of the Goodyear and Avondale area was 30,000. The current land uses in the vicinity of the site consist of agriculture, industry, and residential developments. Figure 2 presents a more detailed view of the PGA site.

During the 1940s and 1950s, aircraft maintenance operations were conducted at PGA. Historic operations used chlorinated solvents for degreasing engine and machine parts.

In 1983, the PGA site was placed on EPA's National Priorities List subsequent to ground water monitoring studies performed in 1982 and 1983 which identified six area wells that were contaminated with TCE and exceeded the federal drinking water standard of 5 ppb. Section 16 lies in the southern area and includes the Loral Corporation facility (formerly owned by Goodyear Aerospace Corporation) and the Phoenix-Goodyear Airport (formerly owned and operated by the U.S. Navy). Included in Figure 2 are the approximate locations of all existing wells on Loral and PGA properties.

On September 6, 1988, the U.S. EPA and Goodyear entered into a consent decree. Under the provisions of the consent decree, Goodyear agreed to perform an operable unit (OU) remedial action at the PGA site. The OU remedy involves pumping ground water to contain the spread of TCE beneath Section 16, treating it, and then reinjecting the clean, treated water into the ground.

On September 26, 1989, the U.S. EPA issued a Record of Decision for the PGA site. Based on the PGA RI/FS, the preferred alternatives for the south portion of the site consists of extraction and treatment of Subunit B/C ground water, and soil vapor extraction (SVE) system for the vadose zone.

2.2 SCOPE OF WORK

The SVES for the extraction and collection of TCE contaminated soil and ground water includes the following tasks:

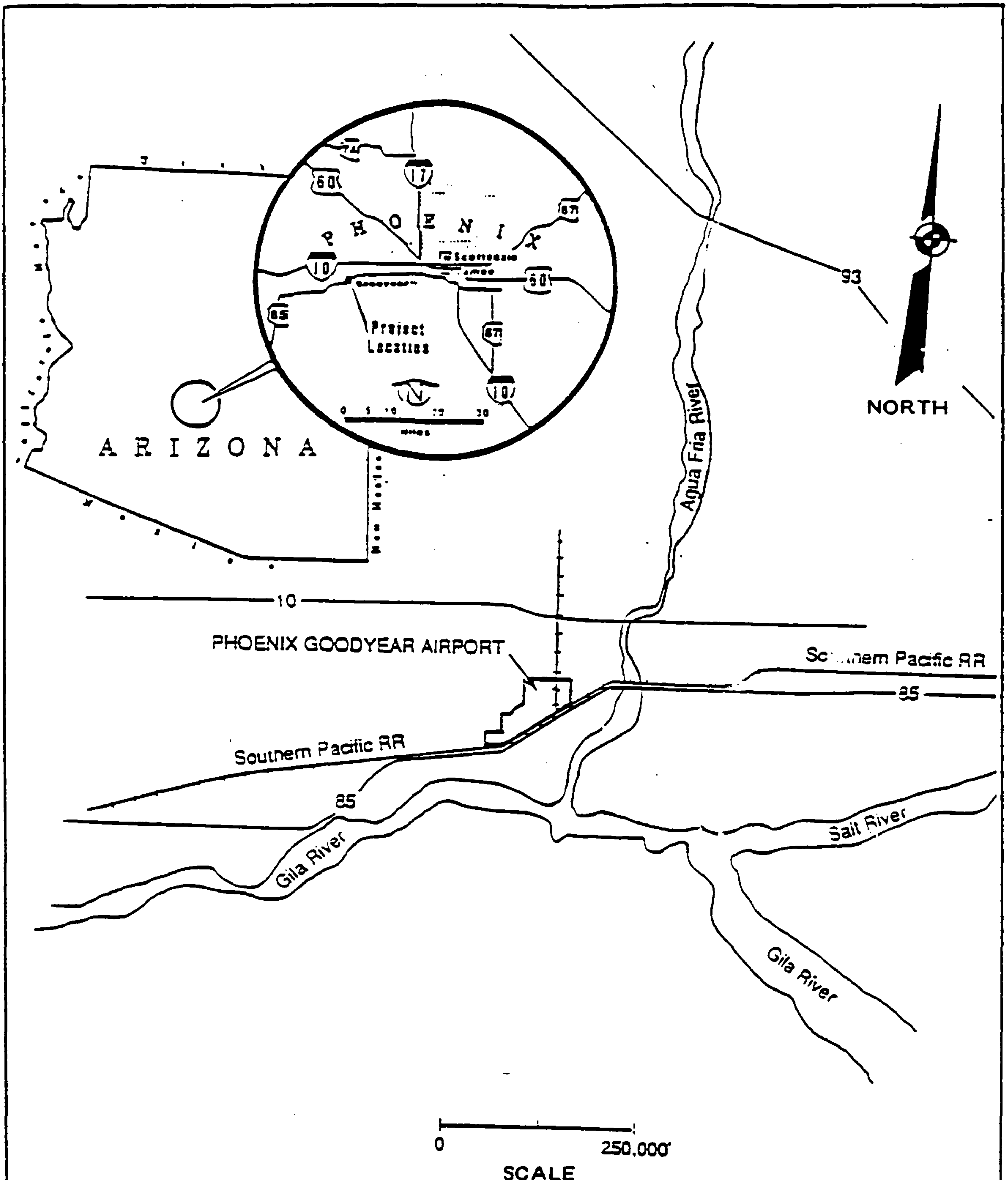
- conduct a soil gas survey of select areas of site
- collection of soil boring samples at soil gas locations
- drilling and construction of soil vapor monitoring and extraction wells
- construction and installation of Soil Vapor Extraction System

2.3 CHEMICAL/WASTE CHARACTERISTICS

Chemicals and wastes at the PGA site are present as liquids, solids, sludge, gases, and vapors. The chemicals and waste materials at the site may be characterized as: corrosive, volatile, toxic, and reactive. Chemical names of materials known to be presence at the PGA site are shown in Table 1.

2.4 SITE FEATURES

The site encompasses an operational airport (Goodyear Municipal Airport), industrial facilities occupied by Loral Corporation, and the Arizona Training Center.



Metcalf & Eddy

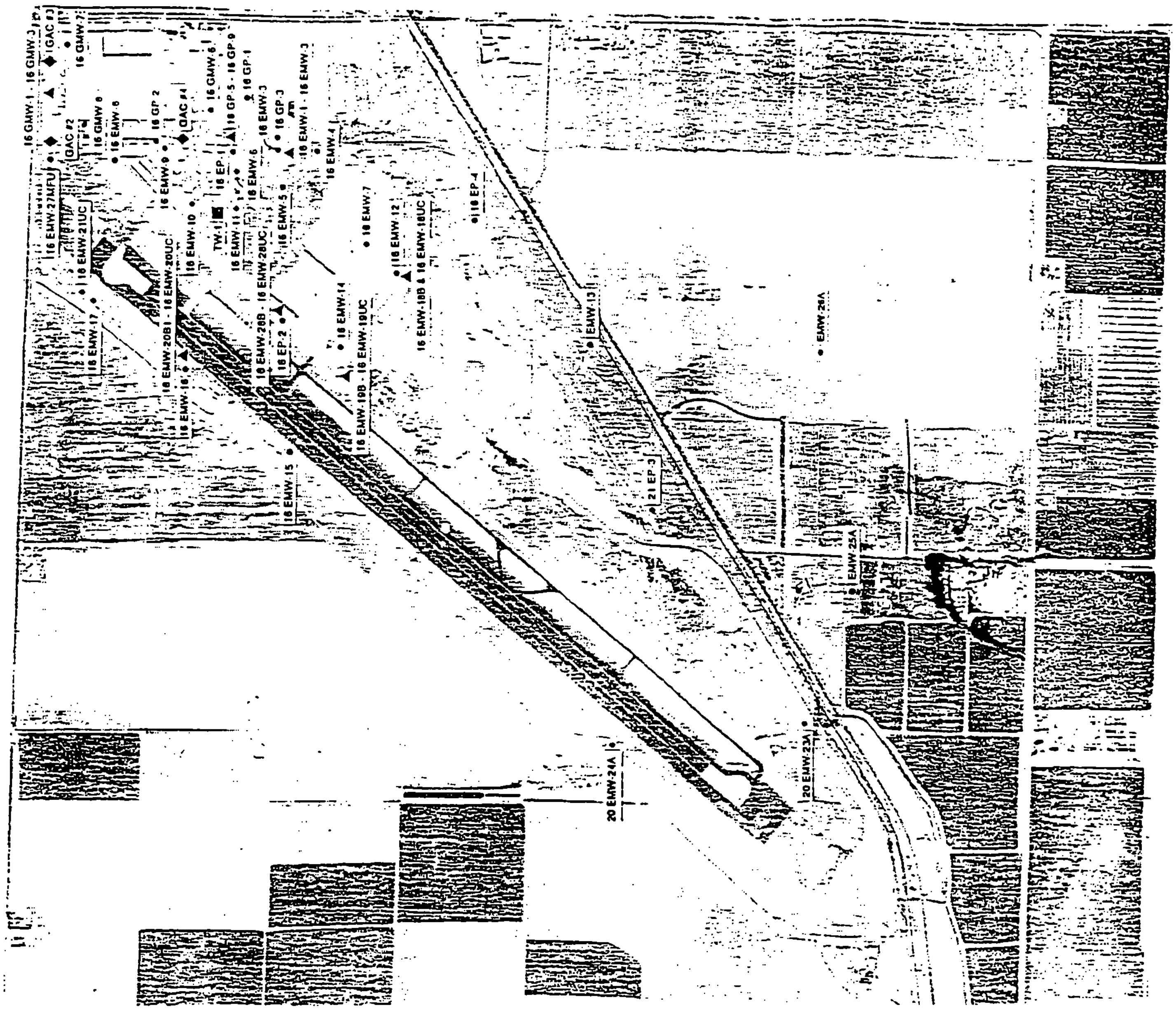
PGA SITE LOCATION MAP

GOODYEAR-PHOENIX AIRPORT

Project Number 006791

Figure 1

SOURCE: ICF TECHNOLOGY INC. & BARTHOLOMEW ENG



NORTH

0 500 1000 Feet

SCALE

LEGEND

- Single Monitoring Well
- ◆ Production Well
- ▲ Well Cluster
- ■ Test Well

M&E Metcalf & Eddy

CURRENT WELL LOCATIONS AT PGA

GOODYEAR-PHOENIX AIRPORT

CHECKED	DRAWN	SCALE	PROJECT No.	FIGURE
		NOTED	006791	2

The PGA site contains railroad tracks, airport operational facilities and a runway, industrial installations, commercial and residential establishments, and above-ground and underground utilities.

2.5 SITE HISTORY

Soil boring and ground water analyses have shown the presence of contaminants in soil and ground water. Several drinking water wells in the area exceeded action levels for TCE and were shut down. The residents were provided bottled water. No injuries as a result of the presence of hazardous wastes at the site have been reported in the past. Previous environmental monitoring has indicated the following:

Air Monitoring. Air monitoring during previous ground water sampling and other field activities indicated no detectable volatile organic compounds at the well heads or elsewhere on site using field organic vapor detection instruments.

Ground Water Monitoring. In 1981 the Arizona Department of Health Services (ADHS) discovered that the ground water in the PGA area was contaminated with solvents and chromium. Additional sampling of area wells by ADHS and the EPA in 1982 and 1983 respectively, discovered 18 wells contaminated with TCE, six of which exceeded the 5.0 ppb ADHS and EPA drinking water action level for TCE. The results of EPA's remedial investigations indicate the ground water contamination consisted primarily of VOCs and chromium. Maximum concentrations of VOCs and inorganics detected in the ground water samples collected from on-site production and monitoring wells, are presented in Table 1.

Soil Analysis. Surface and subsurface soil samples have been collected by Goodyear and the U.S. EPA during the last several years to determine levels of priority pollutants, pesticides, and metals. Maximum concentrations of chemicals reported at concentrations above detection limits in soil samples collected from various locations are given in Table 1. The contaminants reported at the site are generally present in very low concentrations.

Elevated levels of chromium and cadmium were reported in the Goodyear Aerospace Corporation (GAC) sludge drying bed area soils only.

3.0 SCOPE OF WORK

The SVES for the extraction and remediation of TCE contaminated soil and ground water include the following tasks:

- conduct a soil gas survey
- collection of soil boring samples
- drilling and construction of soil vapor extraction wells
- construction and installation of Soil Vapor Extraction System

A brief description of each of these tasks is given below.

3.1 SOIL GAS SURVEY

A soil gas survey will be conducted over the south portion of the PGA site. The soil gas survey will include a maximum of 108 soil gas points at an average depth of five feet. The results from the soil gas survey will identify areas for potential soil borings. This data will also be used to compare against soil gas data collected in 1986/1987.

3.2 SOIL BORINGS

Soil boring samples will be collected from a maximum of 30 points. Samples will be collected from surface soil to a depth of 60 feet below grade or until ground water. The samples will be collected using a 6 1/4 inch (ID) hollow stem auger advancing a five foot continuous coring sampler. The continuous coring sampler will contain a five foot plastic sleeve. At five foot intervals the core sampler will be retrieved and the plastic sleeve removed. The plastic sleeve will be cut into intervals and screened. Samples will be obtained from the plastic sleeve and submitted to the lab for analysis.

3.3 DRILLING AND CONSTRUCTION OF SOIL VAPOR EXTRACTION WELLS

Soil vapor extraction wells installed in the vadose zone. The wells will be installed to a maximum depth of 60 feet. Four-inch diameter Sch 40 PVC wells will be installed by hollow stem auger method. A 0.020 inch slot screen will be installed at a depth to be decided by the on-site geologist. The screen will be surrounded by rough coarse gravel with a bentonite plug installed above the screened region. The soil vapor extraction wells will be connected to the SVES by Sch 40 PVC piping.

3.4 CONSTRUCTION AND INSTALLATION OF SOIL VAPOR EXTRACTION SYSTEM

The SVES will include;

- subsurface manifold
- surface manifold
- one air/water separator
- two particulate filters
- air blower and duct work
- the effluent air from the blower will be treated with two (2) vapor phase granular activated carbon beds

The SVES will be located in the south portion of the site. All fabrication and construction, not absolutely required to be performed in the field, shall be performed in a factory prior to transportation to the site. The actual assembly of the SVES poses little potential for chemical exposure or contamination.

4.0 HAZARD EVALUATION

4.1 CHEMICAL HAZARDS

Soil and ground water sampling results summarized in Table 1 indicate that TCE and chromium are the only toxic chemicals that were reported at levels that may have potential inhalation, dermal, or ingestion exposure to workers at the site engaged in the soil gas survey, collection of soil borings and installation of the SVES.

A maximum of 350 mg/l of TCE and 1.34 mg/l of total chromium were reported in some wells in the activity area. A maximum of 2.5 mg/kg of TCE were reported in some soil borings at the site. Although 32,243 mg/kg of total chromium and 112 mg/kg of cadmium were reported in the sludge drying beds. These elevated concentrations of chromium and cadmium will be taken into account in determining chemical hazards and personnel protection levels during field operations covered by this plan. The concentration of other VOCs and toxic metals in ground water and soils were detected at very low concentrations or were below the TLV and/or PEL levels and thus do not have a significant potential of exposure.

The primary potential exposure hazard at this site during activities covered by this plan is due to the presence of TCE in soil and ground water. The potential hazards associated with TCE are described below:

4.1.1 Health Effects of TCE

TCE is a volatile chlorinated hydrocarbon solvent, used industrially for more than a century and also used to some degree as a general anesthetic. Industrially, acute inhalation exposures above 500 ppm produce typical organic solvent CNS depression (narcosis) effects such as dizziness, incoordination, and ultimately stupor and/or coma (like many other solvents). Experience with this substance in anesthesia has shown it capable of sensitizing the heart to adrenalin, and it is speculated that this sensitization has been the cause of death in individuals "sniffing" the solvent or otherwise very heavily exposed.

Chronic inhalation exposures of 50-450 ppm have reportedly caused liver cancer in mice, but not in rats in the same study. NIOSH has recommended the exposure limit be set at 25 ppm, and also considers TCE a potential human carcinogen, though not a potent one. ACGIH recommends a TLV of 50 ppm. OSHA established a PEL of 50 ppm and STEL of 200 ppm, which has been stayed (July, 1992) by a court and is of uncertain status.

TCE presents the highest toxic hazard of all VOCs detected on-site, even though others are much more toxic, because of the high levels found (see Table 1). Other VOCs detected are all volatile chlorinated hydrocarbons. Carbon tetrachloride and chloroform produce liver and kidney toxicity after chronic inhalation exposures at levels above 10 ppm.

4.1.2 Exposure Assessment for TCE

The potential for TCE exposure from contact with and proximity to contaminated soil is estimated as low. Soil sampling results indicate that TCE is present in the soil at a maximum 2.5 mg/kg. This level does not represent a potential hazard. However, every effort will be made by the field team to limit contact with contaminated soil and ground water by good hygienic practices and proper PPE selection.

TABLE 1

MAXIMUM CONCENTRATIONS OF CHEMICALS REPORTED IN SOIL AND GROUNDWATER AT PGA SITE AND TOXICITY CHARACTERISTICS

Chemicals	Soil Maximum Conc. mg/kg	Groundwater Maximum Conc. ug/l	TLV ppm	TLV mg/m3	PEL mg/m3	PEL ppm	IDLH mg/m3	IDLH mg/m3	Target Organs	Potential Exposure Routes
Organics:										
Trichloroethylene	2.5	16,200	50	270	50	–	1,000	–	Suspected carcinogen, CNS, liver, respiratory	1,2,3
1,1-Dichloroethylene	0.4	140	5	20	1.0	–	–	–	Suspected carcinogen, CNS, liver, kidney	1,2,3
Trans-1,2,-Dichloroethylene	–	3.6	200	790	200	790	–	–	CNS, liver, kidneys, respiratory sys.	1,2,3
1,1-Dichloroethane	–	3.3	200	810	100	400	4,000	–	Suspected carcinogen, liver, kidneys	1,2,3
1,2-Dibromoethane	–	2	A2	–	20	–	400	–	Suspected carcinogen, liver, kidneys	1,2,3
Acetone	–	3	750	1,780	750	1780	20,000	–	Respiratory system	1,2,3
Carbon tetrachloride	–	5.1	5A2	30	2	–	300	–	Suspected carcinogen, CNS	
Chloroform	–	12.8	10A2	50	2	–	–	–	Suspected carcinogen, liver, kidney, Heart, eyes, skin	1,2,3
Methylene chloride	–	13.2	50A2	175	500	–	5,000	–	CNS, CVS, skin, eyes	1,2,3
Toluene	–	16	100	375	100	–	2,000	–	CNS, liver, kidneys, skin	1,2,3
Total xylenes	–	8,800	100	240	100	480	10,000	–	CNS, liver, kidneys, eyes, skin	1,2,3
Trichlorofluoromethane	0.5	–	1,000	5,600	100	Ceil	–	–	CNS, respiratory sys.	1,2,3
Chlorobenzene	0.5	–	75	350	75	350	2,400	–	CNS, liver, respiratory sys.	1,2,3
4-DDT	0.8	–	–	1	–	1	–	–	Suspected carcinogen, skin, respiratory sys.	1,2,3
4-DDE	1.2	–	–	1	–	1	–	–	Suspected carcinogen, skin, respiratory sys.	1,2,3

TABLE 1 (Continued)

MAXIMUM CONCENTRATIONS OF CHEMICALS REPORTED IN SOIL AND GROUNDWATER AT PGA SITE AND TOXICITY CHARACTERISTICS

Chemicals	Soil Maximum Conc. mg/kg	Groundwater Maximum Conc. ug/l	TLV ppm	TLV mg/m3	PEL mg/m3	PEL ppm	IDLH mg/m3	IDLH mg/m3	Target Organs	Potential Exposure Routes
Metals:										
Aluminum	16,817	3,020	–	2	–	2	–	–	Lungs	2,3
Antimony	–	360	–	0.5	–	0.5	–	–	Respiratory sys., CVS, skin, eyes	2,3
Arsenic	16	28	–	0.2	–	0.01	–	–	Suspected carcinogen, liver, kidneys, lungs	2,3
Barium	218	900	–	0.5	–	0.5	–	30	Heart, CNS, respiratory sys., eyes	2,3
Chromium (Total)	32,242**	1,340	–	0.05 (vi)A1 0.5(iii)	–	0.1(vi) 0.5(iii)	–	250	Liver, kidneys, respiratory sys., skin, eyes	2,3
Copper	27	40	–	1.0 0.2 fume	–	1.0 0.1 fume	–	–	Respiratory sys., skin, liver	2,3
Cyanide	–	10	–	5	–	5	–	50	CNS, CVS, liver, kidney, blood	2,3
Lead	30	20	–	0.15	–	0.05	–	–	CNS, kidneys, blood	2,3
Zinc	81	3,580	–	–	–	–	–	–	Respiratory sys., skin, eyes	2,3
Cadmium	112**	–	–	0.05	–	0.1	–	40	Respiratory sys., kidney, prostate, blood	2,3

* 1 = Inhalation; 2 = Skin Absorption; 3 = Ingestion

** Concentrations of cadmium and chromium in soil samples were highest at the GAC Sludge Drying Beds. No activities covered by this plan are to be undertaken in or near the Sludge Drying Beds.

4.2 HAZARDS ANALYSIS FOR SITE

4.2.1 Construction of Soil Vapor Extraction System

This task includes use of a variety of small to heavy equipment. PVC or steel pipe will be installed in trenches of depth insufficient to introduce the lethal cave-in hazards covered by OSHA's excavation Safety standard at 29 CFR 1926 Subpart P. During these activities, potential of accidents and physical injury exist. All materials- or equipment-handling tasks offer potential for the human body to be caught under or in between objects or to be knocked over. Hazards to footing that also can result in falls are inherent in this type of work.

Back injuries are second only to falls as a source of lost time resulting from accidents. Even when heavy materials and subcomponents are handled by means of mechanical aids such as cranes and hoists, the potential for overexertion, pulls, and strains from manual efforts at final alignment and manipulation will present a significant injury potential. The use of hoists demands a high level of knowledge and skills in rigging so that loads are safely lifted and transported. A chain or wire rope sling is subject to failure if it is not used strictly in accordance with guidance based on safe working loads for the chain or rope, and on the geometry of various lifting arrangements that affect the actual stresses on the material. In addition, such equipment must be inspected regularly and rigorously by an experienced individual.

Fork lift trucks present a set of hazards peculiar to themselves. Trucks are designed for the essential purpose of lifting heavy weights. They are counterbalanced for the purpose, and are fitted with wheels and running gear suitable for the floor or terrain where they're intended to operate. However, it is not practicable to design these tools in such a way as to eliminate the need for a high level of operator training and knowledge. In particular, probably no lift truck can safely travel with the load held high off the floor or ground surface.

Construction activities may raise airborne dust levels. Only in the area of the sludge drying beds does it appear that a potential for overexposure to soil contaminants is present. No construction activity within this area is anticipated.

4.2.2 Drilling and Construction of Soil Vapor Extraction Wells and Soil Borings

Drilling operations involve use of heavy equipment and machinery, and physical trauma can occur. The greatest injury (fatality) potential probably lies in the possibility of becoming entangled in the rotating equipment. Hazards of becoming caught in between moving objects or a moving and a stationary object, are also very significant. Contact with overhead, or possibly buried, electrical lines is a very serious hazard that requires training or experience to recognize. When high-voltage conductors are involved, actual contact is not necessary for an electrocution current to flow. In even of contact between any part of the equipment and live electrical circuits, an electric current will flow to ground through the equipment. The typical electrocution accident happens when a worker standing on the ground is in contact with the equipment, and a portion of the ground fault current flows through the workers body. Only a very small portion of the fault current, flowing through the worker's body, is required to cause death.

4.2.3 Soil Gas Survey

Soil gas survey operations involve the advancement of a steel soil gas probe by a hydraulic push/pull mechanism mounted to a support vehicle. The hazards common to work with vehicles and mechanical powered equipment will be inherent in this work. Underground utilities may also contribute hazards.

4.2.4 Heat Stress

Heat stress is probably the most serious potential physical hazard associated with the PGA site. Summer temperatures in the Phoenix area frequently exceed 100°F and construction personnel are subject to heat stress. Protective clothing can greatly enhance heat stress. Appendix A provides details on heat stress management.

4.2.5 Equipment Operation.

Start-up testing can offer the potential for equipment to be operated with compromised, or absent, guarding around points of operation or around power transmission equipment. During start-up and testing, each piece of equipment will be operated separately, and then together to check performance. These operations may include operation of items in configurations not fully anticipated by their designers, i.e. with safety guarding compromised or hazardous parts accessible in ways that they will not be accessible under normal operations.

Noise abatement equipment may be absent in initial stages of testing and operation, and high noise levels may contribute to all other hazards by compromising ones hearing ability. Noise levels are commonly higher under test conditions.

The operation of equipment will present some potential for exposure to airborne contaminants, which should be easily controlled.

5.0 SITE OPERATIONS

5.1 ENVIRONMENTAL MONITORING EQUIPMENT REQUIREMENTS

A variety of environmental monitoring instruments will be required to assess conditions during field operations. The number of monitoring instruments needed will depend on the number of concurrent operations in progress at the site. This will be determined prior to field mobilization. The following is a list of instruments required for field operations:

- Volatile Organic Compound Monitor -- either flame or photoionization detector;
- Oxygen Monitor; and
- Combustible Gas Indicator (CGI).

5.2 OPERATING PROCEDURES AND METHODS FOR SURVEILLANCE

Instruction manuals will be followed for instrument calibration and operation. During invasive construction operations and well sampling, air in the breathing zone will be monitored regularly with an organic vapor detector (either photoionization or flame ionization detector). Combustible gas and oxygen levels will be monitored regularly with a combustible gas/oxygen meter during invasive operations and prior to any cutting, welding, or grinding operation.

Action levels for environmental monitoring and required levels of protective equipment are shown in Table 2.

5.3 PERIMETER ESTABLISHMENT

The location of areas of known surface contamination (the chrome sludge pits) is established and the area is fenced. All construction/drilling work will be conducted inside the Phoenix Goodyear Airport property. As part of the normal security for an active airport, this part of the PGA site is surrounded by chain link fence with access controlled by a security guard. No public access is permitted in the construction area without passing through the control point. Exclusion zones will be established as needed at each individual work location and delineated with temporary barriers.

TABLE 2

ACTION LEVELS

Monitor Results	Action
HNU/OVA readings are 0 - 12 ppm* in the breathing zone	Level D PPE
HNU/OVA readings are 12 - 200 ppm** in the breathing zone	Level C PPE
HNU/OVA readings are > 200 ppm in the breathing zone	Withdraw and implement engineering controls using Level B PPE until levels below 200 ppm are obtained.
If Oxygen meter indicates <19.5% or >25% 02	Withdraw and implement engineering- controls to restore normal 0_2 level.
If Combustible Gas Meter indicates:	
<10% LEL	Work as normal.
10%-20% LEL	Monitor Continuously
>20% LEL	Withdraw and implement engineering- neered controls to reduce combustible gas

*Volatile action level is selected to be 50% of the NIOSH recommended 10-hour exposure limit for TCE of 25 ppm. This is a conservative approach, but is expected to be workable on this site.

**Maximum concentration should not exceed the Short Term Exposure Level (STEL) averaged over 15 minutes without respiratory protection.

6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Personal Protective Equipment (PPE) will be utilized as indicated by on-site environmental monitoring. All previous field operations at the site have been conducted in Level D protective equipment. It is anticipated that most, if not all, work performed under this plan will be conducted in Level D PPE. Site personnel should be equipped to upgrade PPE to Level C if needed. The following sections describe the recommended equipment for each level of protection. Other specialty field activities (e.g., field welding, excavation, etc.) will require other specific protective measures and equipment which will be designated by the SSO.

6.1 LEVEL D PPE

Level D PPE is used when no respiratory protection is required and minimum skin protection is required. This level will not be worn in exclusion zones where action levels (given in Table 2) warrant Level C protection. The following equipment constitute Level D gear:

RECOMMENDED:

- Coveralls.
- Steel toe and steel shank safety boots/shoes.
- Safety glasses or chemical splash goggles.
- Hard hat.
- Gloves.

OPTIONAL:

- Escape mask.
- Face shield.

6.2 LEVEL C PPE

Level C PPE is used when types of air contaminants have been identified, concentrations measured, and a canister or a set of cartridges are available that can remove the contaminant. The atmosphere where level C protective equipment is used must not exceed IDLH levels and must contain at least 19.5 percent oxygen. The following equipment constitute Level C protection gear:

RECOMMENDED:

- Full-face piece, air-purifying, twin cartridge or canister-equipped respirator.
- Chemical-resistant clothing (hooded, one- or two-piece chemical splash suit; disposable chemical-resistant one-piece suit).
- Inner and outer chemical-resistant gloves.
- Chemical-resistant steel toe and steel shank safety boots/shoes.
- Hard hat.
- Two-way radio communications

- Escape mask.

OPTIONAL:

- Face shield.

6.3 RECOMMENDED LEVELS OF PROTECTION BY TASK

6.3.1 Soil Gas Survey

Personnel	Respiratory	Clothing	Other
Construction Manager	D	Coveralls Safety Boots Hard Hat Safety Glasses	Gloves as needed
Site Health and Safety Officer	D	Coveralls Safety Boots Hard Hat Safety Glasses	Gloves as needed
Construction Subcontractor Personnel	D	Coveralls Safety Boots Hard Hat Safety Glasses Gloves	

Note: Respiratory protection may be upgraded to Level C (air-purifying respirator with appropriate organic vapor cartridges) if site monitoring equipment indicates that action levels have been reached.

6.3.2 Collection of Soil Borings Samples

Personnel	Respiratory	Clothing	Other
Team Leader	D	TYVEK coveralls, Neoprene Safety Boots, Hard Hat Safety glasses	Splash Goggles

6.3.2 Collection of Soil Borings Samples -- continued

Personnel	Respiratory	Clothing	Other
Site Health and Safety Officer	D	TYVEK coveralls, Neoprene Safety Boots,Hard Hat Safety glasses	
Drilling Subcontractor Personnel	D	TYVEK coveralls, Neoprene Safety Boots, Hard Hat Safety glasses, Nitrile gloves	

Note: Respiratory protection may be upgraded to Level C (full-face air purifying respirators with appropriate organic vapor cartridges) based on air monitoring at the site.

6.3.3 Drilling and Construction of Soil Vapor Extraction Wells

Personnel	Respiratory	Clothing	Other
Team Leader	D	TYVEK coveralls, Neoprene Safety Boots, Hard Hat Safety glasses	Splash Goggles
Site Health and Safety Officer	D	TYVEK coveralls, Neoprene Safety Boots,Hard Hat Safety glasses	
Drilling Subcontractor Personnel	D	TYVEK coveralls, Neoprene Safety Boots, Hard Hat Safety glasses, Neoprene gloves	

Note: Respiratory protection may be upgraded to Level C (air-purifying respirator with appropriate organic vapor cartridges) if site monitoring indicates that action levels have been reached.

Note 2: Under heat stress conditions, the Site Safety Officer may substitute for "Tyvek" coveralls another type of work clothing that offers less contribution to heat stress. The work clothing will not be worn away from the site.

6.3.4 Construction, Installation, Testing, and Operation of Soil Vapor Extraction System

Personnel	Respiratory	Clothing	Other
Team Leader	D	TYVEK coveralls, Neoprene Safety Boots, Hard Hat Safety glasses	Splash Goggles as needed
Site Health and Safety Officer	D	TYVEK coveralls, Neoprene Safety Boots, Hard Hat Safety glasses	Splash Goggles as needed
Drilling Subcontractor Personnel	D	TYVEK coveralls, Neoprene Safety Boots, Hard Hat Safety glasses, Neoprene gloves	Splash Goggles as needed

Note: Respiratory protection may be upgraded to Level C (air-purifying respirator with appropriate organic vapor cartridges) if site monitoring indicates that action levels have been reached.

Note 2: Under heat stress conditions, the Site Safety Officer may substitute for "Tyvek" coveralls another type of work clothing that offers less contribution to heat stress. The work clothing will not be worn away from the site.

7.0 SITE PERSONNEL RESPONSIBILITIES

Each company working on the SVES construction at the PGA site shall be responsible for the safety of its own employees. Before work begins, each implementing firm will be required to appoint a Site Safety Officer and prepare a site specific Health and Safety Plan for their employees.

The SVES Project Manager shall be responsible for all aspects of the construction, including compliance with OSHA rules and this HSP. The Project Manager will assign a Project Health and Safety Officer who will be responsible for assuring that each implementing firm has a plan and is implementing it in accordance with OSHA requirements.

Resident engineer will assist by checking that the respective site safety officers are properly implementing their plans. The resident engineer will maintain documentation on health and safety matters and will provide periodic reports to the PHSO. The resident engineer will also call the weekly safety meeting.

7.1 PROJECT HEALTH AND SAFETY OFFICER (SSO)

The SSO reports directly to the Project Manager on issues of health and safety of field operations. He is responsible for executing the provisions of this provisional Health and Safety Program as applicable to field operations. He is responsible for reviewing all site safety plans for construction and sampling and for assuring that these are approved by the respective management personnel and properly executed. He has direct authority over all on-site personnel on matters of health and safety and is able to stop all site work for safety reasons. He also has the responsibility of revising site safety plans when additional hazards are identified during the course of construction.

The duties of the SSO shall include:

- continuous health and safety supervision on-site;
- conducting site safety briefing;
- enforcing compliance with the HSP;
- conducting air monitoring as specified in the HSP;
- maintaining and calibrating health and safety equipment;
- supervising personnel and equipment decontamination;
- controlling access to designated exclusion zones;
- maintaining a site safety log; and
- reporting injuries, illnesses, and exposures to the PHSO.

7.2 FIELD PERSONNEL

All field personnel must comply with the provisions of this site safety plan, and sign the signature form presented in this plan. All field personnel must practice contaminant avoidance at all times.

7.3 WORK LIMITATIONS

All site work will be done during daylight hours. The buddy system will be in effect at all times when exposure potentials are present in the work or in the work area being occupied.

8.0 DECONTAMINATION AND DISPOSAL PROCEDURES

8.1 DECONTAMINATION PROCEDURES

Exclusion zones will be established at the site during various operations. Decontamination of construction vehicles (backhoes, bulldozers, cement mixers, drilling equipment); soil and ground water sampling equipment; and personal gear will be conducted as needed when leaving exclusion zones. The following sections describe recommended decontamination procedures for various equipment and vehicles.

8.1.1 Construction Vehicles

Equipment used in invasive operations (trenching, excavation, or drilling) will be steam cleaned before leaving the site. A heavy plastic decontamination pad will be constructed at the construction site to clean the vehicles. The decon water will be collected according to the procedures outlined in the drilling equipment decontamination procedures.

8.1.2 Drilling Equipment Decontamination

Before drilling operations are undertaken, the drill rigs and all drilling tools will be thoroughly steam cleaned at the driller's storage yard. The rig will be inspected to verify that there are no fluid leaks and that the rig is in proper and safe operating condition. Any unacceptable conditions encountered during this inspection will be remedied before the rig is taken onto the site.

The drilling tools will also be steam cleaned after each boring is completed. The continuous core sampler will be decontaminated with water and detergent after each sample is collected. The entire rig will be steam cleaned at the completion of the project and before it leaves the site at any time.

A temporary decontamination pad will be constructed for cleaning the drilling rig, other vehicles (if needed) and other large pieces of equipment. After being cleaned, the drill tools will be kept clean. Tools may not be laid on contaminated or potentially contaminated soil, and must be kept on the rig or laid on plastic sheeting.

8.1.3 Support Vehicles

Interiors of construction support vehicles will be swept and washed with a household cleaner and paper toweling on an as-needed basis. It is recommended that all vehicles except drilling rigs and necessary construction equipment, be kept in uncontaminated, paved areas and therefore should not require decontamination.

8.1.4 Personal Gear

All personal equipment will be left on-site or thoroughly decontaminated at the end of the work shift. To the extent possible, outer clothing (including boots, coveralls and gloves) should be left on-site throughout the construction project. This will minimize the spread of contaminants to vehicles or employees' homes. After removing any protective clothing, all workers should wash face and hands before leaving the site, and should shower as soon as possible after the work shift.

8.1.5 Soil and Ground Water Sampling Equipment

All sampling equipment which comes into contact with soil or ground water samples will be decontaminated, including the continuous core sampler, sample rings, bailers, transfer vessels, and funnels.

8.2 DISPOSAL PROCEDURES

8.2.1 On-Site Disposal

There will be three types of wastes generated during the site activities:

- Drill cuttings (box or covered piles);
- Equipment decontamination rinse water; and
- Disposable clothing.

Soils suspected of being contaminated will be labelled with site source location and will be temporarily stored on site at a secured location. Test results from the sampling of soils will determine if contaminant levels exceeded the Arizona State action levels and would require disposal as hazardous waste. Goodyear will be responsible for disposal of waste material generated during field activities.

Disposable clothing used in areas suspected of contamination will be stored separately and identified by location. If soils from that area are found to be contaminated, then the clothing will be disposed of as contaminated material with the soil. Otherwise, the clothing will be treated as common solid waste.

Monitoring well development and purge water and equipment decontamination rinse water will be disposed of in the City of Goodyear's sewer system under a permit from the City of Goodyear.

8.2.2 Off-Site Disposal

If determined hazardous, the soils will be disposed of by Goodyear at a licensed and permitted facility. M&E will assist Goodyear by assuring that wastes are properly labeled, segregated and sampled to minimize disposal costs.

9.0 TRAINING AND MEDICAL SURVEILLANCE PROTOCOL

9.1 EMPLOYEE CERTIFICATION FORM

The on-site Health & Safety Officer or designated representative shall be responsible for informing all individuals entering the exclusion zone or decontamination reduction zone of the contents of this plan and ensuring that each person signs the Employee Certification Form in Appendix B. By signing the Employee Certification Form, individuals are recognizing the hazard present on-site and agreeing to abide by the policies and procedures required to minimize exposure or adverse effects of these hazards.

9.2 TRAINING REQUIREMENTS

All personnel (including visitors) entering the exclusion zone or decontamination reduction zone must have completed training requirements for hazardous waste site work in accordance with OSHA 29 CFR 1910.120 or by qualified by previous training or experience. Documentation of training requirements is the responsibility of each employer.

All personnel (including visitors) entering the exclusion zone or decontamination zone using a negative pressure respirator must have received training on its use and successfully passed a respirator fit test in accordance with OSHA 29 CFR 1910.134 or ANSI Standard Z88.2 (any revision) or any OSHA substance-specific standard, within the past 12 months. Documentation of fit testing protocol is required for the use of negative pressure respirators for protection against airborne asbestos fibers (OSHA 29 CFR 1926.58) and lead (OSHA 29 CFR 1910.1025).

All personnel (including visitors) entering the exclusion zone or decontamination zone using atmosphere supplying respiratory equipment must also have received training in its use, and must be in compliance with OSHA 29 CFR 1910.134 and ANSI Standard Z88.2-1969 as adopted by OSHA.

9.3 MEDICAL SURVEILLANCE

All personnel (including visitors) entering the exclusion zone or decontamination zone must have completed appropriate medical monitoring requirements as required under OSHA 29 CFR 1910.120 (f). Documentation of medical monitoring is the responsibility of each employer.

9.4 HEALTH AND SAFETY BRIEFING

Daily safety meetings will be held at the start of each shift to ensure that all personnel understand site conditions and operating procedures, to ensure that personal protective equipment is being used correctly, and to address workers health and safety concerns. A record of all personnel attending the meeting and a summary of what was covered in the meeting will be kept in the field log book.

10.0 EMERGENCY INFORMATION

10.1 REQUIRED EMERGENCY INFORMATION

This HSP contains pertinent emergency information for use in the event of an on-site emergency. The HASP includes the following;

- Location of on-site resources (i.e.: water supplies, radio and telephone communications);
- Ambulance and Poison Control Center telephone-numbers;
- Hospital Emergency Room telephone number and directions to hospital from site;
- Fire Department telephone number;
- Project Manager and Project Health and Safety Coordinator telephone numbered; and
- Client Contact telephone number.

10.2 EMERGENCY PHONE NUMBERS

Name		Phone Numbers
Ambulance	American Ambulance	(602) 253-1492
Hospital Emergency Care	Maryville Samaritan Hospital	(602) 848-5000
Poison Control Center	Good Samaritan Hospital	(602) 239-2000
Fire	City of Goodyear	(602) 932-3050
Police		
Explosives Unit (if applicable)	Phoenix Fire Department	(602) 262-6771
CHEMTREC		1-800-424-9300
TSCA Hotline (Toxic Substances Control Act)		202-554-1404
CDC (Center for Disease Control) (24 hrs.)		404-454-4100 or 404-329-2888
National Response Center		1-800-424-8802
Pesticide Information Center		1-800-845-7633
EPA ERT Emergency		201-321-6660
RCRA Hotline		1-800-424-9346
Bureau of Explosives		202-835-9500

Other Phone Numbers:

Corporate Health and Safety Officer	(Work) (617) 246-5200
Name: Richard Renzi	(Home) (508) 475-0190
Program Safety Officer	(Work) ()
Name: William Collier, CIH	(Home) ()
Project Manager	(Work) (614) 890-5501
Name: Greg Binder	(Home) ()
Site Safety and Health Officer	(Work) (805) 962-2122
Name: Scott P. Zachary	(Home) (805) 962-1244

Site Resources:

Water Supply

Phone

Radio

Electricity

Lighting

Rest Rooms

Other

10.3. NOTIFICATION AND VERIFICATION:
Directions to Hospital*[2] (Attach map)

From Goodyear Airport, proceed north on Litchfield Avenue to Interstate 10. Take I-10 to 51st Street exit. Take 51st Street north to Campbell Avenue. Go left on Campbell Avenue. The hospital is on the corner of 51st Street and Campbell Avenue.

The route to the hospital was verified by

________________ on ________________.

Present Status and Capability of Emergency Response Teams:

_____ Able to respond to site emergencies.

_____ Unable to respond to site emergencies.

____
On-Site Safety Officer

10.4 EMERGENCY RESPONSE:

Line of Authority:

The Site Safety Officer will assume command and direct emergency operations until such time is a more senior person (e.g. Site Manager) actively assumes command, in which case the Site Safety Officer will advise and assist in direction of operations. Civil authorities responding to an emergency assume command of operations, and will have pre-arranged methods of determining the line of authority.

A. Injury/Exposure:

In the event of an injury, the victim should be stabilized and provided on-site first aid in the "clean zone". If an injury involves a potential trauma to the spinal cord, the victim shall remain where injured, if safely possible, and be moved by trained emergency medical technicians only. Minor injuries such as small lacerations, cuts and strains shall be initially treated on-site by the first aid qualified member of the field team. Ambulance and hospital support shall be provided for all major injuries such as head wounds, broken bones, and deep lacerations. Should an injury involve a contaminant exposure, and there is no potential spinal cord trauma, perform the following procedures:

- Escort victim to the decontamination station
- Remove all contaminated clothing
- Wash exposed body areas with a potable water flush (10 minutes)
- Cover with blanket or (if injury is not serious) dress victim in clean clothing
  Transport victim (with the H&S Plan) to hospital if necessary

B. Chemical/Oil Release - Spill Containment:

2

*** Emergency phone numbers and maps to the hospital will be posted in the office, decontamination area and all vehicles.**

In the event a hazardous material release occurs during the site investigation activities, attempt to control, divert, absorb, neutralize, or secure the source, if direct contact or inhalation hazards are not present. If direct contact or inhalation hazards are present, do not attempt any remedial measures. All hazardous material release incidents shall be reported to the appropriate state EPA office. The following information should be provided during a notification:

- Chemical/oil name or DOT I.D. number
- Chemical/oil hazard class
- Cause of release
- Quantity concentration of release

C. Fire/Explosion:

In the event of a fire, attempt to extinguish it with a Class ABC (or other suitable) fire extinguisher if safe to do so. If the fire appears to be growing "out of control", perform the following steps as applicable:

- Pull site horn warning alarm
- Evacuate field team to the site entrance (relocate this assembly point if necessary)
- Verify all present
- Notify Fire Department
- Remove vehicles if safely possible
- Remove flammable field solvents if safely possible
- Await fire fighting forces
- Contact the Project Manager and the Regional Safety Coordinator once the Fire Department is in control of the situation

D. Emergency Evacuation Routes:

To be determined by the SSO prior to beginning work.

E. Emergency Alerting Procedures:

See the Emergency Response Equipment Map containing the location of all emergency response equipment. This map will be posted at entrance to all zones.

Emergency Response Equipment Map

Fire Extinguishers:

Eyewash/Shower Station:

Alarm Systems:

Emergency Phone:

First Aid Kits/Equipment:

11.0 PLAN REVIEW

This site health and safety plan has been written for the exclusive use of Metcalf & Eddy, Inc. employees. M&E claims no responsibility for its use by others. The plan is written for the specified site conditions, dates, and personnel and must be amended if these conditions change.

PLAN PREPARED BY:

____ DATE: ____________________

REVIEWED BY:

____ DATE: ____________________
Regional Safety Coordinator

____ DATE: ____________________
Corporate Health and Safety Officer

12.0 HEALTH & SAFETY LOG BOOK

The on-site Health & Safety Officer will keep a log book to record site Health and Safety information and to document subcontract personnel working on-site and other site visitors. At a minimum, the following information will be included in the log book on a daily basis:

- Date and time of observations
- Weather conditions
- Personnel on-site (w/company title)
- Air monitoring equipment in use
- Work activity conducted
- Level(s) of protection
- Air monitoring equipment readings obtained during work activity
- Any health & safety-related issues or situations.
- Any communications with regulatory agencies
- Signature of on-site Health and Safety Officer

13.0 HEALTH & SAFETY FIELD ACTIVITY RECORD

A daily record of field activities is to be recorded in the Site Field books.

APPENDIX A

HEAT STRESS MANAGEMENT

APPENDIX A

HEAT STRESS MONITORING

Elevated temperatures during summer months at the PGA site necessitate a heat stress monitoring program to be implemented. The program follow the guidelines established by ACGIH and NIOSH. The site workers must learn to recognize and treat the various forms of heat stress as summarized below:

1. HEAT STRESS

Heat stress usually is a result of protective clothing decreasing natural body ventilation, although it may occur at any time work is being performed at elevated temperatures.

If the body's physiological processes fail-to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur ranging from mild (such as fatigue, irritability, anxiety, and decreased concentration, dexterity, or movement) to fatal. Because heat stress is one of the most common and potentially serious illnesses at hazardous waste sites, regular monitoring and other preventative measures are vital.

The best approach is preventative heat stress management. In general:

Have workers drink 16 ounces of water before beginning work, such as in the morning or after lunch. Provide disposable, 4 ounce cups, and water that is maintained at 50| - 60|F. Urge workers to drink 12 of these cups water every 20-minutes, for a total of 1-2 gallons per day. Provide a cool place for rest breaks. Discourage the use of alcohol and the intake of coffee. Monitor for signs of heat stress.

Acclimatize workers to site work conditions by slowly increasing workloads, i.e., do not begin site work activities with extremely demanding activities.

Provide cooling devices to aid natural body ventilation. These devices, however, add weight, and their use should be balanced against worker efficiency. An example of a cooling aid is long cotton underwear which acts as a wick to help absorb moisture and protect the skin from direct contact with heat-absorbing protective clothing.

Install mobile showers and/or hose-down facilities to reduce body temperature and cool protective clothing.

In hot weather, conduct field activities in the early morning or evening.

Ensure that adequate shelter is available to protect personnel against heat, as well as cold, rain, snow, etc., which can decrease physical efficiency and increase the probability of both heat and cold stress. If possible, set up the command post in the shade.

In hot weather, rotate shifts of workers wearing impervious clothing.

Good hygienic standards must be maintained by frequent changes of clothing and showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

2. HEAT STROKE

Heat stroke is an acute and dangerous reaction to heat stress caused by a failure of heat regulating mechanisms of the body the individual's temperature control system that causes sweating stops working correctly. Body temperatures rises so high that brain damage and death will result if the person is not cooled quickly.

Symptoms: Red, hot, dry skin, although person may have been sweating earlier; nausea; dizziness; confusion; extremely high body temperature, rapid respiratory and pulse rate; unconsciousness or coma.

Treatment: Cool the victim quickly and obtain medical help immediately! If the body temperature is not brought down fast, permanent brain damage or death will result. Soak the victim in cool but not cold water, sponge the body with cool water, or pour water on the body to reduce the temperature to a safe level (102 | F). Observe the victim and be ready to provide respiratory support if needed. Do not give coffee, tea or alcoholic beverages.

3. HEAT EXHAUSTION

Heat exhaustion is a state of very definite weakness or exhaustion caused by the loss of fluids from the body. The condition is much less dangerous than heat stroke, but it nonetheless must be treated.

Symptoms: Pale, clammy, moist skin, profuse perspiration and extreme weakness. Body temperature is normal, pulse is weak and rapid, breathing is shallow. The person may have a headache, may vomit, and may be dizzy.

Treatment: Remove the person to a cool, air conditioned place, loosen clothing, place in a head-low position, and provide bed rest. Consult a physician. The normal thirst mechanism is not sensitive enough to ensure body fluids replacement. Have patient drink 1-2 cups water immediately, and every 20-minutes thereafter, until symptoms subside. Total water consumption should be about 1-2 gallons per day.

4. HEAT CRAMPS

Heat cramps are caused by perspiration that is not balanced by adequate fluid intake. Heat cramps are often the first sign of a condition that can lead to heat stroke.

Symptoms: Acute painful spasms of voluntary muscles; e.g., abdomen and extremities.

Treatment: Remove victim to a cool area and loosen clothing. Have patient drink 1-2 cups water immediately, and every 20-minutes thereafter, until symptoms subside. Total water consumption should be 1-2 gallons per day. Consult with physician.

5. HEAT RASH

Heat rash is caused by continuous exposure to heat and wet conditions and aggravated by chafing clothes. The condition decreases ability to tolerate heat.

Symptoms: Mild red rash, especially in areas of the body in contact with protective gear.

Treatment: Decrease amount of time in protective gear, and provide powder to help absorb moisture and decrease chafing.

6. HEAT STRESS MONITORING AND WORK CYCLE MANAGEMENT

For strenuous field activities that are part of on-going site work activities in hot weather, the following procedures shall be used to monitor the body's physiological response to heat, and to manage the work cycle, even if workers are not wearing impervious clothing.

Measure Heart Rate (HR). Heart rate should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute. If the HR is higher, the next work period should be shortened by 33%, while the length of the rest period stays the same. If the pulse rate still exceeds 110 beats/minute at the beginning of the next rest period, the following work cycle should be further shortened by 33%. The procedure is continued until the rate is maintained below 110 beats/minute.

Measure Body Temperature. Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest: period should not exceed 99.6°F. If it does, the next work period should be shortened by 33%, while the length of the rest period stays the same. If the OT exceeds 99.6°F at the beginning the next period, the following work cycle should be further shortened by 33%. The procedure is continued until the body temperature is maintained below 99.6°F.

Manage Work/Rest Schedule. The following work/rest schedule shall be used as a guideline:

Adjusted Temperature (°F)	Active Work Time (min/hr) Using Level B/C Protective Gear:
75 or less	60
80	40
85	30
90	20
95	10
100	0

To calculate the adjusted temperature:

T (adjusted) - T (actual) + (13 x fraction sunshine)

Measure the air temperature with standard thermometer. Estimate fraction of sunshine by judging what percent the sun is out; 100% sunshine - non cloud cover 1.0; 50% sunshine - 50% cloud cover - 0.5; 0% sunshinefull cloud cover - 0.0).

APPENDIX B

EMPLOYEE CERTIFICATION

APPENDIX B

EMPLOYEE CERTIFICATION

By my signature, I certify that I have read, understand, and will abide by, the health and safety plan for the Phoenix Goodyear Airport site.

Printed Name	Signature	Company	Date

APPENDIX C

MATERIAL SAFETY DATA SHEETS

APPENDIX D

HAZARDOUS MATERIALS EXPOSURE REPORT

HAZARDOUS MATERIALS EXPOSURE REPORT

Dates on Site: ____________________

Name of Employee: ____

Last First Initial

Project No.	Site Name/ Location	Duration on the Activity	Chemical or Other Materials Site (Days/Hours)	Present

If you believe you had a possible or actual exposure or injury, complete the following:

Date/Time of Exposure   Type of Exposure   Duration of Exposure

Date/Time of Injury   Type of Injury

Date/Time of Notification of Injury   Individuals Notified

Employee Signature   Date

Regional Safety Coordinator Signature   Date

APPENDIX E

SITE SAFETY PLAN AMENDMENTS

SITE SAFETY PLAN AMENDMENT

Amendment # ______________________________

____

Project # ______________ Date: ______________

Type of Amendment: ______________________________

Reason for Amendment: ______________________________

____

____

____

Additional Required Changes in Other H&S Procedures: ______________

____

____

____

____

____

Required Changes in PPE: ______________________________

____

____

____

Regional Health & Safety Coordinator Date

____

Health & Safety Manager Date

____

APPENDIX F

CARBON CHANGEOUT PROCEDURES

(For a detailed Carbon Changeout Procedures, see November 5, 1993
SVE Operations and Maintenance Manual)

APPENDIX H

DRAFT SOIL VAPOR EXTRACTION (SVE) TREATMENT SYSTEM AND EXTRACTION/MONITORING WELL FIELD SAMPLING PLAN (FSP) AND QUALITY ASSURANCE PROJECT PLAN (QAPP)

DRAFT SOIL VAPOR EXTRACTION (SVE) TREATMENT SYSTEM AND EXTRACTION/MONITORING WELL FIELD SAMPLING PLAN (FSP) AND QUALITY ASSURANCE PROJECT PLAN (QAPP)

1.0 INTRODUCTION

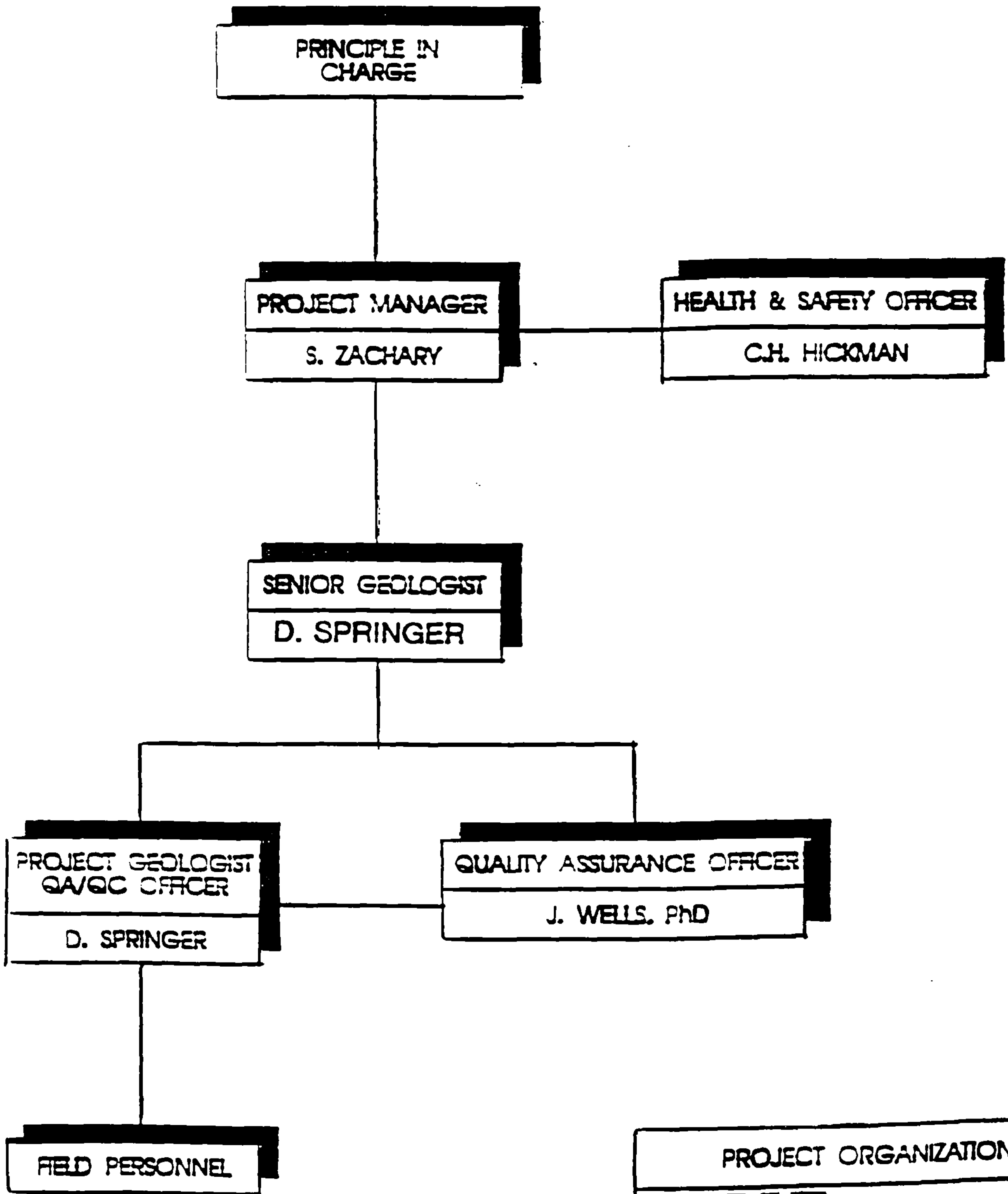
Comprehensive Quality Assurance (QA) objectives for the sampling of the Soil Vapor Extraction (SVE) treatment system and extraction/monitoring wells for the SVE operable unit remedy at the Phoenix-Goodyear Airport site (PGA) have been developed to provide guidelines for all field and laboratory procedures. The intention of the sampling and analysis effort is to produce data of acceptable quality to allow for an accurate evaluation of SVE efficiency and progress, and to ensure representative sampling of soil vapor from the SVE treatment system and associated extraction/monitoring wells. This Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP) presents protocols to be followed in ensuring the quality and integrity of the SVE treatment system and extraction/monitoring well sampling and analysis, accuracy and precision of the laboratory and field analyses, representativeness of the results, and completeness of the information.

The main QA objective for this work is to ensure that all measurements are representative of actual site conditions and that all data resulting from sampling and analysis activities are comparable. The use of accepted, published, sampling and analysis methods, as well as the use of standardized units, shall aid in ensuring the comparability of the data.

1.1 PROJECT ORGANIZATION AND RESPONSIBILITIES

This section identifies the key personnel proposed for this project and the support staff expected to be needed (see Figure 1-1).

Key personnel include the following staff members:



PROJECT ORGANIZATION		
M&E Metcalf & Eddy		
Drawn by: J. Weidmann	Job Number: 006791	Date: September 1992
Checked by: S. Zachary		Figure Number: 1-1

The Project Manager, Scott Zachary is responsible for ensuring that all activities are conducted in accordance with the work plans and within the overall contractual obligations. Mr. Zachary will: 1) monitor the project budget and schedule; 2) ensure the availability of personnel, equipment, subcontractors, and services; and 3) participate in all phases of the project including the development of the SVE operable unit program, SVE remedial efficiency and progress, and report on the technical and financial status of the project. Mr. Struttmann also will provide technical coordination with the Goodyear Tire and Rubber Company (Goodyear) and direct M&E's technical staff.

The Project Geologist, Mr. David Springer, will conduct the field investigation activities described in this sampling section. Mr. Springer will function as the site Quality Assurance Officer and will be on site during all field activities and oversee operations. Any logistical problems hindering field activities such as equipment malfunctions or availability, personnel conflicts, or weather-dependent working conditions will be relayed and resolved by the Project Manager. Mr. Springer will be responsible for maintaining communication with the off-site and on-site analytical laboratory, as well as logging communications and site entries and departures by personnel.

The Quality Assurance Officer (QAO), Mr. James Wells, Ph.D. is responsible for implementing and administering the Quality Assurance Project Plan (QAPP) to ensure that all QA objectives of the project are met, to review selected field and analytical data, and to verify the quality of analytical data to be used in the SAP. The QAO is responsible for on-going surveillance of project activities and has the authority to recommend that work be stopped when that work appears to jeopardize data quality.

The Health and Safety Officer (HSO), Mr. Herb Hickman, will review and approve the Health and Safety Plan prepared for this specific investigation, and ensure that an adequate level of personal protection exists for hazards anticipated in the field. The HSO is responsible for the daily supervision and documentation of all safety, decontamination, environmental monitoring, and field medical monitoring activities. The HSO has the authority to stop work which may result in an imminent safety hazard, emergency condition, or other potentially dangerous situation. Authorization to resume work will be issued by the HSO in conjunction with the Project Manager subsequent to such action.

2.0 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are based on the concept that different data uses may require varying minimum levels of data quality. Data quality is defined as the degree of certainty of a data set with respect to precision, accuracy, reproducibility, comparability, and completeness. DQOs are qualitative and quantitative statements specifying the required quality of data needed to support SFI activities. The five established levels of data are:

1) Screening (DQO Level 1): This level provides the lowest data quality, but the most rapid results. It is often used for health and safety monitoring at the site, initial site characterization to locate areas for subsequent and more accurate analyses, and for engineering screening of alternatives.

2) Field Analyses (DQO Level 2): This level provides rapid results and better data quality than Level 1. Analyses may include mobile laboratory generated data. This level is used to verify a select portion of analytical results obtained from DQO Level 1.

3) Engineering (DQO Level 3): This level provides a high intermediate level of data quality and is used for site characterization. Engineering analyses may include mobile laboratory generated data and some EPA approved analytical laboratory methods (e.g., laboratory data with quick turnaround used for screening but without full quality control documentation).

4) Conformational (DQO Level 4): This level provides the highest level of data quality and is used for purposes of risk assessment, engineering design, and cost analyses. These analyses require full laboratory analytical and data validation procedures in accordance with U.S. EPA recognized protocols.

5) Non-Standard (DQO Level 5): This level refers to analyses by non-standard protocols (e.g., when exacting detection limits or analysis of an unusual compound). These analyses often require method development or adaptation. The level of quality control is usually similar to DQO Level 4 data.

M&E will generate DQO Levels 1, 2, and 3 analytical data during the SFI sampling activities, as detailed below:

- DQO Levels 1 and 2: Field Gas Chromatograph (GC) analyses performed, for health & safety monitoring, and field screening of samples using portable field equipment.

- DQO Level 3: Laboratory analyses performed on soil vapor samples collected during sampling of the SVE treatment system and SVE extraction/monitoring wells.
- DQO Level 4 and Level 5: No Level 4 or 5 requirements have currently been identified.

2.1 DATA QUALITY CHARACTERISTICS

This project requires that five major characteristics of data quality, namely precision, accuracy, representativeness, completeness and comparability (PARCC), be addressed during development of the project-specific environmental sampling and analytical plans.

2.1.1 Precision

Precision is a measure of agreement among individual measurements of the same property under similar conditions. It is expressed in terms of relative percent difference (RPD) between replicates or in terms of the standard deviation when three or more replicate analyses are performed.

Precision is calculated as the relative percent difference (RPD) of the recoveries of each compound in the matrix spike and the matrix spike duplicate. The formula for calculating RPD is as follows:

RPD = 1 MSR - MSDR 1 X 100

$$RPD = \frac{1\ MSR - MSDR\ 1}{(\frac{1}{2})\ (MSR + MSDR)\ X\ 100}$$

Where:

MSR = Matrix Spike Recovery

MSDR = Matrix Spike Duplicate Recovery

RPD is always expressed as a positive value

MSR is further defined as:

$$MSR = \frac{SSR - SR}{SA} X 100$$

Where:

SSR = Spiked Sample Result

SR = Sample Result

SA = Spike Added

Precision shall be determined through the use of MS/MSD analyses. The RPD between the two results shall be calculated as a measure of analytical precision.

2.1.2 Accuracy

Accuracy is defined as the degree of agreement of a measurement (or measurement average) with an accepted reference or true value. It is a measure of system bias and is usually expressed as a percentage of the true value.

Accuracy shall be determined in the laboratory through the use of matrix spike and matrix spike duplicate (MS/MSD) analyses. The laboratory shall perform these analyses in conformance with U.S. EPA protocols. For soil vapor analyses, the accuracy is defined in Section 5.0. Accuracy, or percent recovery, is calculated as follows:

$$\% \; Recovery = \frac{Concentration \; (amount) \; found \in sample}{Concentration \; (amount) \; spiked \in matric} X 100$$

Sampling accuracy shall be maintained by the implementation and adherence to strict procedural protocols. Trip blanks and equipment blanks shall be collected and analyzed to ensure that samples are representative of site conditions and not contaminated by transportation or sampling methods, respectively.

2.1.3 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a data population, process condition, a sampling point, or an environment. For this project, grab samples shall be taken, and such samples are, by definition, representative of the conditions only at the point in time collected, within sampling and analytical error. The sampling network rationale was designed to provide data representative of affected site conditions and unaffected background condition. Consideration was given to past site practices, existing analytical data, the physical setting at the PGA facility, and constraints inherent to performance of specific objectives.

2.1.4 Completeness

Completeness is a measure of the amount of valid data obtained compared to the amount expected to be collected under normal correct conditions. It is usually expressed as a percentage.

The objectives of the field sampling events at the PGA facility are to obtain samples for all analyses required at each individual site, to provide a sufficient quantity of sample for each of the required analyses, and to obtain quality control samples representative of all possible contamination sources (e.g., sample collection, storage, transportation, etc.). It is expected that the analytical laboratory will provide data that meet quality control acceptance criteria of 100 percent (see Table 2-1A). Tables 2-1B provides targeted acceptance criteria for the field laboratory.

Completeness is calculated as the percentage of valid data points compared to the quantities of valid data that was to be collected to achieve particular project requirements. Data points may not be valid if samples exceeded holding times, if quality control sample criteria were not met and reanalysis of samples was not possible, or if samples containers were broken or otherwise destroyed. The overall completeness objective for this project is 100%.

TABLE 2-1A

Data Quality Objectives
Phoenix-Goodyear Airport Superfund Site
Summary of Precision, Accuracy, Completeness Objectives
(Soil Vapor Rebound Analysis - Lab)

PARAMETER Target Compound List	Method №1 Reference Modified	Detection Limits	Precision (a) (as RPD)	Accuracy (b) (Recovery)	Completeness
Benzene	EPA TO-14	.2-.5ppbv	15%	80-120%	100%
Carbon Tetrachloride	EPA TO-14	.2-.5ppbv	15%	80-120%	100%
Chlorobenzene	EPA TO-14	.2-.5ppbv	15%	80-120%	100%
Chloroform	EPA TO-14	.2-.5ppbv	15%	80-120%	100%
1,1-Dichloroethane	EPA TO-14	.2-.5ppbv	15%	80-120%	100%
1,2-Dichloroethane	EPA TO-14	.2-.5ppbv	15%	80-120%	100%
1,1-Dichloroethene	EPA TO-14	.2-.5ppbv	15%	80-120%	100%
cis 1,2-Dichloroethene	EPA TO-14	.2-.5ppbv	15%	80-120%	100%
trans 1,2-	EPA TO-14	.2-.5ppbv	15%	80-120%	100%
Dichloroethene	EPA TO-14	.2-.5ppbv	15%	80-120%	100%
Methylene Chloride	EPA TO-14	.2-.5ppbv	15%	80-120%	100%
Tetrachloroethene	EPA TO-14	.2-.5ppbv	15%	80-120%	100%
Toluene	EPA TO-14	.2-.5ppbv	15%	80-120%	100%
Trichloroethene	EPA TO-14	.2-.5ppbv	20%	60-140%	100%
Vinyl Chloride	EPA TO-14	.2-.5ppbv	15%	80-120%	100%
Total Xylenes	EPA TO-14	.2-.5ppbv	15%	80-120%	100%
1,1,1-Trichloroethane					

a) Precision-Relative Percent Difference (RPD) between duplicate matrix spike recoveries, or duplicate analyses.
b) Accuracy-Percent matrix spike recovery.
c) Soil vapor will be analyzed under U.S. EPA Method TO-14 and speciated for the above compounds as a minimum.

TABLE 2-1 B

Data Quality Objectives
Phoenix-Goodyear Airport Superfund Site
Summary of Precision, Accuracy, Completeness Objectives
(Soil Vapor Rebound Analysis - Field GC)

Parameter	Method № Reference	Detection Limit	Precision (a) (as RPD)	Accuracy (b) Recovery	Completeness	Data Quality Objective Level
Trichloroethene	Modified TO-14 IND	50 ppb	20%	80-120%	100%	2
1,1-Dichloroethene	Modified TO-14 IND	50 ppb	20%	80-120%	100%	2
Tetrachloroethene	Modified TO-14 IND	50 ppb	20%	80-120%	100%	2
1,1,1-Trichloroethane	Modified TO-14 IND	50 ppb	20%	80-120%	100%	2

a) Precision - Relative Percent Difference (RPD), between duplicate matrix spike recoveries or duplicate analysis
b) Accuracy - Percent matrix spike recovery.
IND Quantifies indicator compounds (TCE, PCE 1,1-DCE AND 1,1,1-TCA)

The percent completeness is calculated as:

$$\%C = \frac{NA}{NI} X 100$$

Where:

N_A = Actual number of valid analytical results obtained.

N_I = Theoretical number of results obtainable under ideal conditions.

2.1.5 Comparability

Comparability expresses the confidence with which one data set can be compared to another. To achieve comparability in this project, the data generated shall be reported using units of micrograms per liter (µg/l) for field blank water samples, and parts per billion of volume of air (ppbv) for soil vapor analysis. By using sampling and analysis procedures consistent with US EPA protocols, all data sets shall be comparable within a specific site and between sites to ensure that a consistent data base is used from which decisions concerning remedial action are made. To ensure data comparability, standard analytical reference materials traceable to NBS, U.S. EPA, or equivalent standards shall be used to establish that analytical procedures are generating valid data. The procedures used to obtain the planned analytical data, however, may not be directly comparable to existing data due to differences in analytical procedures and quality assurance objectives. Additionally, different quantities of a compound may be reported from the same sample by the same laboratory using different analytical techniques. This may result from variability within a non-homogenous sample, such as soil, or from extraction efficiency variation among methods.

2.2 DATA QUALITY OBJECTIVES FOR FIELD ACTIVITIES

The DQOs that have been developed for field activities to be conducted at the PGA facility take into consideration specific requirements of the SAP. The requirements are intended to provide acceptable technical data and tracking procedures to accurately obtain, describe, and evaluate representative samples of the subsurface environment. These quality assurance requirements are intended to ensure the validity and certainty of analytical results.

The summary of DQOs and data collection methods developed for the PGA facility SVE operable unit remedy are summarized as the following:

a. The objectives of collecting data from the media associated with each field activity;

b. The analytical and physical data types required to determine the type, degree, and migration characteristics of the contaminants and the required site characteristics.

Included is the estimated number of data points or samples that will be collected to meet the data objective;

c. A description of the sampling method being employed for each type of data;

d. The use(s) for which data are being collected. This has been described by using general purpose categories which represent different data uses (e.g., Health and Environmental Assessment, Evaluation of SVE remedial progress);

e. The analytical method that will be employed to analyze samples. Depending on the analytical DQO level of the associated data, this item may specify an instrument or an analytical method number;

f. The detection limit requirements for the chosen analytical methods. Detection limits will always be lower than the levels of concern or action ranges for the site;

g. The types and numbers of quality control samples that will be collected in association with each sampling event/media.

2.2.1 DQO Assessment and Evaluation

Three types of data sample and analyses are projected to occur during Operation & Maintenance of SVE remedy which include the following:

- Field breakthrough monitoring of carbon treatment beds associated with the SVE system.
- Field sampling and analysis of soil vapor samples collected from Phase II SVE monitoring wells.
- Sampling and CLP laboratory analysis of rebound soil vapor samples collected from Phase II SVE monitoring wells.

Data quality and validity will be assessed and evaluated for each of the three listed data types using the PARCC parameters described in Section 2.1 and as defined in Tables 2-1a and 2-1b. Additionally, for breakthrough monitoring of the carbon beds, since field calibration of the PID monitoring instrument is conducted and periodically checked throughout each day for response drift, precision and accuracy goals are set at ± 20% and completeness at 100%. Since the same instrument is used throughout SVE operations, representativeness and comparability parameters are expected to be within acceptable levels.

3.0 QUALITY ASSURANCE METHODOLOGY FOR SAMPLING

Sampling methods for this SAP are based on M&E and U.S. EPA procedures. Step by step sample collection procedures are presented in detail in the sampling section.

3.1 QUALITY CONTROL SAMPLE TYPES

During sampling, a number of QC samples will be collected and submitted for laboratory analysis. The number and frequency of QC sample collection is determined by the individual project requirements and is outlined in this section.

A list of the types of QC samples that will be collected along with a brief description of each sample type is outlined in the following sections.

3.1.1 Trip Blanks

Trip blanks will be collected for chemical analysis of volatile organics. The analytical results serve as a baseline measurement of volatile organic contamination that samples may be exposed to during transport and laboratory storage prior to analysis.

Trip blanks will not be used for soil vapor samples collected in SUMMA canisters. The canisters are constructed of electropolished stainless steel and afford no ability for sample cross contamination. The sample inlet port cover will be tightened in the field and custody tape will be placed over the valve and sample inlet prior to shipment.

One trip blank will be included in each shipping cooler containing samples for volatile organics. The sample containers will later be stored in the laboratory with the samples and analyzed for the appropriate parameters.

Field blanks will also be collected for analysis of volatile organic compounds. Field blanks serve as a measurement or indicator of contamination which may be introduced during actual sample collection. For soil vapor samples, field blanks will be comprised of ambient air samples which will be collected in the field and transported to the laboratory along with subsurface soil vapor samples for analysis. One (1) field blank will be prepared for every ten (10) soil vapor samples which are collected.

3.1.2 Equipment Blanks

Equipment blanks will be collected from the sampling train used in the collection of soil vapor samples. The analysis of these blanks serves to verify the cleanliness of the sampling equipment. Equipment blanks will be collected in either Tedlar bags or SUMMA canisters. The container will be opened and a sufficient amount of ultra zero air transferred into the sampling device after passing through the entire sampling train following equipment decontamination procedures. The equipment blanks will be analyzed for the same parameters as the associated samples. One equipment blank will be collected for each day of sample collection.

3.1.3 Field Duplicates

Field duplicates are defined as additional samples collected independently of each other at a single sampling location during a single episode of sampling. Analysis of these duplicates provides statistical information relating to sample variability and serves as a check on the precision of sample collection methods as well as analytical procedures.

Ten percent of all samples will be collected in duplicate and submitted for laboratory analysis. Field duplicates will be labeled so that persons performing laboratory analyses cannot distinguish duplicates from other samples. This type of duplicate has also been referred to as a blind duplicate.

3.1.4 Laboratory Quality Control Samples

Laboratory quality control samples indicate laboratory specific problems and provide indices relating to matrix recovery. Method blanks determine the existence and magnitude of contamination problems. Matrix and laboratory spikes provide information about matrix recovery limits. Duplicate analyses (for matrix and blank spikes) are indicators of both the precision and the accuracy of the sample results. M&E will direct the laboratory in the selection of matrix spikes and duplicate analyses.

3.2 SAMPLE PRESERVATION AND QUANTITIES

Table 3-1 lists the type of containers and preservatives required by the laboratory and the maximum holding time allotted for each analysis. The field crew or site manager will make arrangements to procure sample preservatives and decontaminated sample containers, including those necessary for field quality assurance samples, from the laboratory.

3.3 SAMPLE CUSTODY AND IDENTIFICATION

An overriding consideration essential for the validation of environmental measurement data is the necessity to demonstrate that samples have been obtained from the locations stated and that they have reached the laboratory without alteration. Evidence of the sample traceability from collection to shipment, laboratory receipt, and laboratory custody (until proper sample disposal) must be documented. A sample is considered to be in a person's custody if the sample is:

- In a person's actual possession
- In view after being in a person's possession
- Locked so that no one can tamper with it after having been in physical custody
- In a secured area, restricted to authorized personnel

The Project Geologist is responsible for overseeing and supervising the implementation of proper sample custody procedures in the field. He/she is also designated as the field sample custodian and is responsible for ensuring sample custody until the samples have been transferred to a courier and sent directly to the laboratory.

TABLE 3-1

List of Container Type, Required Sample Preservative, and Maximum Holding Time

Matrix	Container Type	Parameters	Preservative	Holding Time
Soil Vapor - Routine Monitoring	Tedlar Bag	Total VOCs	4 Deg C Light Tight Container	24 Hours
Soil Vapor - Rebound Monitoring (1)	Tedlar Bags	Indicator VOCs	4 Deg C	24 Hours
Soil Vapor - Rebound Monitoring	Summa Canister	VOCs	4 Deg C	14 Days
Water - SVE Treatment System Stack Sump	40 mℓ VOA Vial	VOC's (3)	4 Deg C HCL to PH<2	14 Days, unpreserved 7 days.

1) Field laboratory GC analysis - Direct inject or field PID.
2) CLP - laboratory analysis - TO-14
3) PCE, TCE, 1,1-DCE, and 1,1,1-TCA.

Once the samples have been received by the laboratory, samples proceed through an orderly processing sequence specifically designed to ensure continuous integrity of both the sample and its documentation.

3.3.1 Chain of Custody

The chain of custody procedures are initiated in the field following sample collection. The procedures consist of: 1) preparing and attaching a unique sample label to each sample collected, 2) completing the chain of custody form, and 3) preparing and packing the samples for shipment. These procedures are further described in the following sections.

3.3.2 Sample Labels and Tags

Field personnel are responsible for uniquely identifying, labeling, and tagging, all samples collected during a field investigation. All labeling and tagging must be done in indelible/waterproof ink. Any errors are crossed out with a single line, dated, and initialled. Each sample label securely affixed to the appropriate sample container and sample tag attached to the neck of each sample container must contain the following information:

- Client/site name
- Unique project-specific sample identification number (i.e., station number)
- Sample location/description number
- Type of analysis to be performed and the name of the laboratory to whom the samples are being sent
- Sample volume, container type, and the type of chemical preservation used
- Sampling date and time
- Initials of the person obtaining the sample

3.3.3 Chain of Custody Record

A chain of custody form (see Figure 3-1) must be completed for each sample set collected at a sampling location. The form is maintained as a record of sample collection, transfer, shipment, and receipt by the laboratory. The forms must also contain pertinent information concerning sampling location, date, and times; signatures of the sampling team members; types of samples collected along with a unique sample identification number; the number of samples collected and shipped for analysis in each lot; the project name and number; and the name of the laboratory to which the samples are being sent.

3.3.4 Transfer of Custody

Samples shall be accompanied by an approved and completed chain of custody form during each step of custody, transfer, and shipment. When physical possession of samples is transferred, both the individual relinquishing the samples and the individual receiving them shall sign, date, and record the time on the chain of custody form. In the case of sample shipment by an overnight courier, a properly prepared air bill shall serve as an extension of the chain of custody form while the samples are in transit.

3.3.5 Sample Packaging and Shipping

Following sample collection, all samples shall be brought to an on-site location for batching and paperwork checks. At this central location, like sample types are matched (i.e., solids, liquids, gasses, etc.) with similar sample types from all sample locations. Labels and log information are checked to ensure there is no error in sample identification. The samples are packaged to prevent breakage and/or leakage, and the shipping containers are labeled in accordance with the DOT regulations for transport.

As soon as field personnel are ready to transport samples from the field to the laboratory, the laboratory shall be notified by telephone of the shipment along with the estimated time of arrival. All samples shall be shipped directly to the laboratory via an overnight carrier. The

M&E Metcalf & Eddy

CHAIN OF CUSTODY FORM

Job/Project Name:	Job/Project Location:	Job/Project Number:
Samplers: (Signatures)	Recorder (Signature)	Date:
Lab (Samples Sent To):		

SAMPLING		SAMPLE NUMBER	SAMPLE LOCATION	MATRIX					COMPOSITE/GRAB	PRESERVATIVE (Y/N)	ANALYSIS REQUESTED									COMMENTS
Date	Time			Water	Soil														Total #	

Relinquished By: (Signature)	Date: Time:	Received By: (Signature)	Relinquished By: (Signature)	Date: Time:	Received By: (Signature)
Relinquished By: (Signature)	Date: Time:	Received By: (Signature)	Relinquished By: (Signature)	Date: Time:	Received By: (Signature)
Relinquished By: (Signature)	Date: Time:	Received for Lab By (Signature)	Date: Time:	Comments:	
Method of Shipment					

Distribution: **Original** to Lab **Copy 1** to Field Files, **Copy 2** to Project Manager

Form 274 (Rev. 5/89)

FIGURE 3-1

Sample Chain of Custody Form

field team shall determine whether it is best to directly transport the packages to the shipping office or to arrange for on-site pick-up. For each sample shipment to a specific subcontracting laboratory, an overnight airbill must be properly completed.

Unless field collected information indicates otherwise, all environmental samples collected shall be treated as non-hazardous aqueous liquids and non-hazardous gasses.

Because of the expected non-hazardous nature of the collected samples, packaging and shipping criteria have been designed only to maintain chain of custody protocol as well as to prevent breakage of the sample containers. The packaging procedures shall be as follows for soil and/or water samples:

- Place a layer of cushioning material (e.g., vermiculite) in the bottom of the watertight insulated metal or equivalent strength plastic shipping containers.
- Wrap the properly labeled and secured glass sample bottles and purgeable vials with plastic bubble wrap. Place the wrapped containers into watertight zip lock bags and seal the bags closed.
- Place sample bottles/containers (top side up) into the shipping container arranging the bottles so that the glass bottles are surrounded by plastic bottles.
- Using the necessary packing material, pack the sample containers to ensure that they do not shift during transport.
- Fill any void spaces of the shipping container, around and on top of the sample bottles, with ice cubes or chips sealed in plastic bags or with blue ice.
- Seal the appropriate chain of custody form(s) in a zip-lock plastic bag, and tape it securely to the inside of the shipping container lid.
- Close and lock/latch the shipping container. Seal the space between the container body and lid with waterproof tape. (If the shipping container used is a picnic cooler, tape the drain plug closed to prevent any leakage of water as the ice packs melt during transport.)

The packaging procedures for SUMMA canisters shall be as follows:

- Following sample collection, measure residual vacuum using gauge and tightly seal SUMMA by closing canister valve snugly. Do not over-tighten.
- Secure Swage-lok lock cap over threaded sample port using 9/16-inch wrench.

- Affix sample label to SUMMA canister and place SUMMA canister into original fitted corrugated shipping container.
- Seal box with chain-of-custody tape and place within larger shipping box (4 canisters per box).
- Seal the appropriate chain-of-custody form(s) in a Zip-loc plastic bag and tape it securely to the inside of the larger box.

Shipping procedures for all samples are as outlined below:

- Apply several wraps of chain of custody tape around the shipping containers perpendicular to the seal to ensure that the lid remains closed if the latch is accidentally released or damaged during shipment. Do not obscure any stickers or labels on the shipping container with the chain of custody tape.
- Place a completed overnight carrier air bill on the lid of the shipping container. Include the name, address, and telephone number of the receiving laboratory and the return address and telephone number of the shipper on the air bill.
- Place a "This End Up" label on the lid and on all four sides of the shipping container.
- Each shipping container must not weigh more than 150 pounds if it is to be shipped overnight by Federal Express or similar overnight carrier.

3.4 SAMPLE DOCUMENTATION

In all cases, the Field Geologist/Quality Assurance Officer shall maintain a concise, detailed field logbook containing accounts of all field activities and actions taken as well as documentation of observations made.

All sampling procedures, instrument calibration, and information pertinent to sampling conditions, progress, and field data collection must be documented following a prescribed set of guidelines. The documentation serves as a permanent and traceable record of all activities related to a specific field investigation project. The record must be legible and accessible to allow ease in verifying sampling activities and addressing future questions which may arise concerning such issues as sample integrity, and sample traceability.

3.4.1 Sample Designation/Identification

All samples shall be identified by a unique sample identification number which includes the project number hyphenated with a consecutive numbering system specific to the samples collected for that project. For example: 006791-053 identifies this as the 53rd sample collected for project number 006791. The location and sample matrix may be further identified with descriptive information. For example: SV79-1A would describe a soil vapor sample collected at location 1A from Polygon 79. This identification number is used to ensure sample traceability and identifies this particular sample as to its site origin, type, location, sample matrix, and sample data within a specific project; all samples shall be identified using a numbering system cross-referenced to descriptive sample information. The cross-index is to be designed and maintained by the field team leader.

The unique sample identification number shall be recorded on the chain of custody forms accompanying each sample to the laboratory for sample analysis.

3.4.2 Daily Log

The field team leader has the responsibility to maintain the daily field documents pertaining to sample identification and control. Special emphasis is placed on log book completeness and accuracy. Field log books, field data forms, and chain of custody forms must contain entries made with indelible ink and must be dated and signed. All statements in the logbook must be legible, accurate, and include documentation of all project activities. At a minimum, entries into the log book shall include weather conditions, date and time of each sample collection, and references to any difficulties encountered and how such difficulties were resolved.

3.4.3 Records

The following section describes the type of records that will be maintained by project staff members.

3.4.3.1 Field Log Books

A field log book shall be maintained by each field team member for this hazardous waste field investigation project. The log book shall be comprised of a bound book with consecutively numbered pages; no pages must be skipped when filling in the log books. The integrity of field documentation is further ensured by the use of field log books containing paper treated to repel the rain or any other aqueous splashings experienced during field documentation. Should more than one field log book be required, they shall be numbered sequentially.

The front of each field log book shall contain the following information:

- Project name and number
- Name of the contract under which the investigation is being conducted
- Date(s) of use
- Site address: Loral Defense Systems, 1300 S. Litchfield Road, Goodyear, Arizona 85338

The field log book shall contain a diary of all pertinent project activities. Standard information recorded in the field log book includes: general observations made in the field, identification and calibration of instruments used, and field data, including sampling location, sample number, time, date, sample type, sample volume, sample container and sampler's name.

The field log book shall contain the following information:

- Date and time of personnel entries on-site, weather conditions, temperature.
- List of start/stop times of all subcontractors hired for activities such as drilling, steam cleaning, well development.
- List of the personnel present on-site during each sampling day to include all M&E personnel, subcontractors, and visitors.
- List of the equipment decontaminated along with a reference to the procedures used.

- Description of the sampling locations in reference to permanent landmarks.

- List of any changes from standard operating procedures, decisions made in the field, and other pertinent information.

- QA/QC samples associated with the samples collected.

- Equipment and/or instrument identification numbers (if available) for those used.

- Sample preservation techniques performed.

- Air monitoring information gathered (e.g., PID, OVA readings, etc.).

- Level of personal protection mandated (e.g., Level B, C, D) and record of pertinent time intervals spent by each field team member at each level (e.g., time spent in Level C developing a well, time spent in Level C sampling soil from a backhoe, etc.).

- Other logs/paperwork used to document activities.

- Instrument calibration information including the instruments calibrated during the day and the individual who performed the calibration (Note: Instrument calibration information should be documented in the field logbook as well as on the instrument calibration log kept with each instrument, serving to document instrument response over time.)

- List of the samples collected by media (i.e., soil, gas, etc.).

- Comments relative to any problem areas that occurred during the day's activities, their final resolution, and any anticipated impact on the outcome of the field investigation.

The last item to be entered at the bottom of each page of the field log book shall be the signature of the person responsible for completing the data entry.

3.4.3.2 Project Log Book

A unique project-specific log book shall be maintained for the Phoenix-Goodyear Airport environmental investigation. The log book shall be comprised of a bound book with consecutively numbered pages. Should more than one project log book be required, they shall be numbered sequentially.

The primary purpose of this log book is to contain all the data specific to the project in one central location. In general, the project log book shall contain essentially the same information as the field log book. However, the project log book need not list all the actual field data and instrument calibration information generated during a sampling episode. References to other documents that contain specific field activity descriptions, outlines of any administrative occurrences that have affected the field work for any given sampling activity, as well as a summary of the field activities, must be documented in the project log book and kept up-to-date on a daily basis.

3.4.3.3 Field Equipment Log Book

A unique field equipment log book is required for each piece of field equipment (i.e., OVA, PID meter, etc.). This log book is used for the documentation of the proper use, maintenance, and calibration of the field equipment as well as for any information concerning the conformance and decontamination status of each piece of equipment.

The field log book is maintained and kept up-to-date following every use, maintenance, inspection, repair, and/or calibration of the equipment. Entries into the log book should contain the following information:

- Signature of the person making the entry.
- Date of entry.
- Status of equipment in terms of its operational and decontamination standing.
- Reference to the procedures used for calibration or maintenance as well as the procedural results and/or description.
- Name of person(s) using the equipment and a brief description of the nature of the work.
- Calibration log forms used to record all on-site calibrations.

The field equipment log book must be a bound book with consecutively numbered pages. Every page in the log book must be signed by the field equipment maintenance person responsible for keeping each piece of equipment in proper repair and maintained for field use as a reflection of their review and approval of each entry.

3.4.3.4 Field Data Forms

Along with the completion of data entry in each of the above-mentioned log books, field data forms should also be completed and filed in a 3-ring notebook maintained at the sampling site for all field activities.

These forms may include the following:

- Site Health and Safety Log - to maintain accurate health and safety records for each field team member.
- Geologic Boring Log - to document soil boring operations related to SVE extraction/monitoring well construction.
- Monitoring Well Installation Form.
- Monitoring Well Soil Vapor Sampling Worksheet.
- Field parameter forms (including site I.D., sampling and time, field sample number, sample depth (if applicable), and sampling technique).
- Instrument calibration form(s) for photoionization detector (PID) (see Figure D3-2).

3.4.3.5 Chain of Custody Record

Possession of samples shall be traceable from the time a sample is collected until it is used as evidence in legal proceedings, if applicable. To adequately track sample possession, a documented chain of custody must be maintained. See Section 3.3 for more detailed guidelines concerning sample custody.

FIGURE 3-2

PHOENIX-GOODYEAR AIRPORT
PHOTOVAC MICROTIP CALIBRATION LOGFORM

Job #	Instrument #	Operator Initials	Time of Day	Date	Span Gas Conc (ppmV)	Instrument Response	Zero Air Response	Repairs or Comments

3.4.3.6 Materials Certification

Documentation concerning the quality of all materials used on site shall be retained on site for the duration of the Site Investigation at the Phoenix-Goodyear Airport. The following list of documentation for materials certification serves as an example:

- Manufacturer and lot number for calibration standards.
- Labels from distilled water used in decontamination.
- Certificates of cleaning or decontamination furnished by the laboratory (the certificate shall detail the cleaning procedure).

M&E will retain on-site, certified laboratory analyses of all gaseous standards used for instrument calibration. Used isobutlyne or TCE containers for PID instruments with reported concentrations will be retained, in addition to certified results of calibration standards used for the field laboratory gas chromatograph. The Project Manager shall determine the length of time that materials certification documents are to be stored on-site following completion of site investigative and remedial activities.

Documentation and samples of the materials used in the decontamination procedures will be archived for future reference. These materials shall be sampled and labeled in a similar fashion as described for the environmental and field QC samples.

The archived samples shall be stored in clean containers and protected from exposure to the elements for the duration of the site investigation. The Project Manager shall determine the length of time material blanks are to be stored following completion of the site investigation.

3.4.4 Variances

A variance is a deviation from project requirements. All variances from procedural, planning, and design documents, and other project requirements, shall be documented in a Field Change Request.

Field changes and deviations from project planning documents shall be reviewed and approved by the M&E Project Manager or Project Quality Assurance Officer. All deviations from procedural and planning documents shall be recorded in the field log book. Project reports shall detail all field changes and deviations.

4.0 SOIL VAPOR SAMPLING - SVE TREATMENT SYSTEM AND SVE EXTRACTION/MONITORING WELLS

4.1 SCOPE AND APPLICATION

This section covers the materials, equipment and procedures utilized by M&E for collecting soil vapor samples from the SVE treatment system and/or SVE extraction/monitoring cluster wells in the field, and soil vapor samples from SVE monitoring cluster wells for CLP laboratory analysis.

4.2 SAMPLING TRAIN AND EQUIPMENT

4.2.1 Soil Vapor Containers

Laboratory soil vapor samples will be collected using 3 to 6-liter capacity SUMMA canisters. SUMMA canisters will be constructed of electropolished stainless steel. The canisters are precleaned in the laboratory and are shipped pre-evacuated to approximately 28 inches of mercury vacuum. Each canister contains its own sample inlet needle valve onto which is threaded a precleaned, mass flow controller field-calibrated to 200 ml/min sampling rate. Full laboratory decontamination certification will be provided for each SUMMA canister used at the site.

Atmospheric or soil vapor samples for field analyses will be collected in 3-liter capacity Tedlar bags. Each sample bag contains its own sample inlet valve and port for sample tubing. Vapor sample is drawn into the sample bag through the opening of the valve. The flow rate of the sample into the bag will be controlled by placing a calibrated mass flow controller inline between the sample pump and the bag valve.

4.2.2 Sampling Adapters

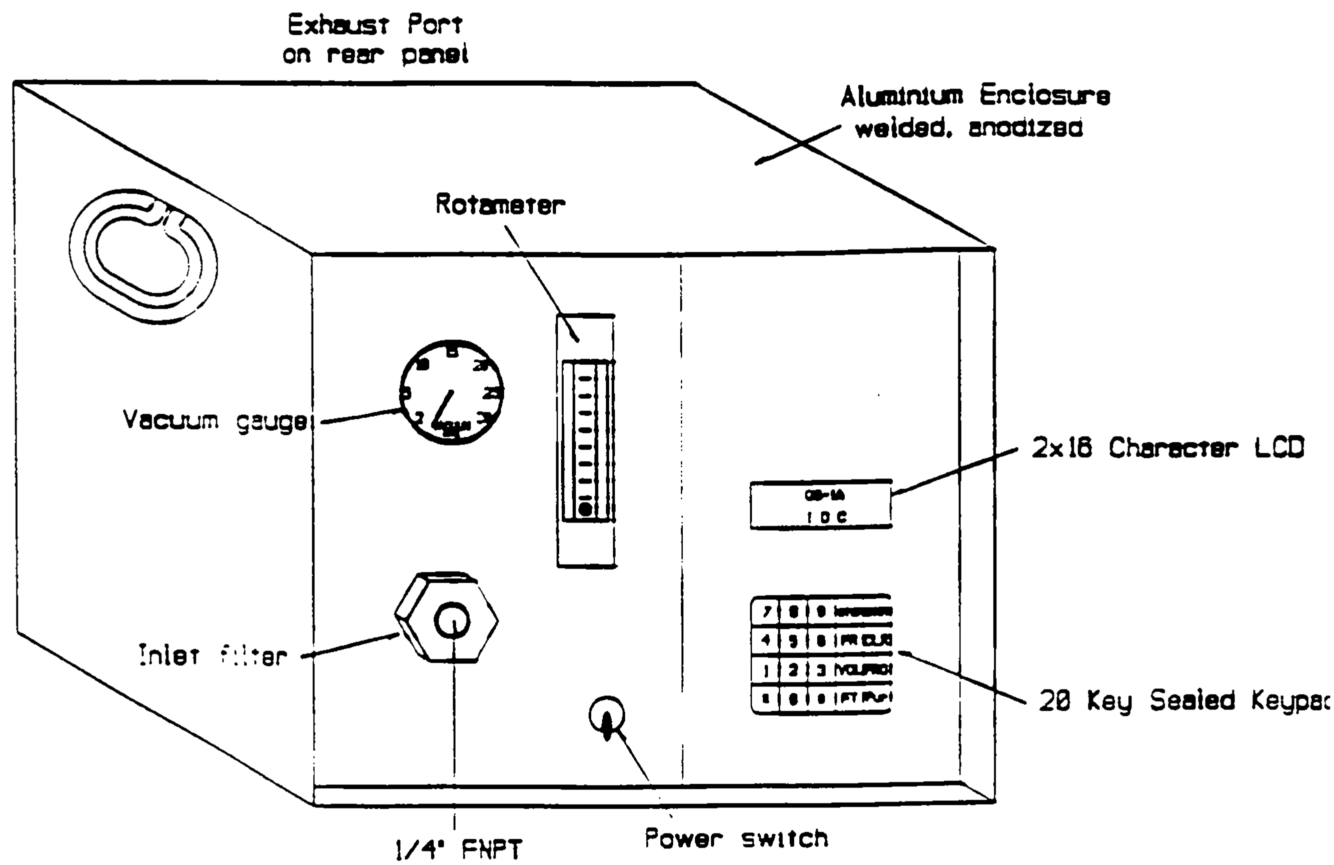
Soil vapor samples will be collected using adapters constructed of stainless steel swage-lok-fittings attached to new 1/4-inch diameter Teflon tubing.

4.2.3 Soil Vapor Sampling Train (Field Analyses)

The vacuum pump M&E will use to collect all soil vapor samples from the SVE treatment system and SVE extraction/monitoring wells for field analyses is a programmable, mass flow controlled vacuum pump (see Figure 4-1). The vacuum pump is a regulated oilless diaphragm type pump. The total volume of soil vapor sample to be purged or collected is pre-programmed using the keypad on the front of the housing. When the specified flow volume has been obtained, a solenoid valve is automatically closed and sampling is discontinued. Following sample collection, the total volume of sample obtained appears on the LCD screen on the front of the housing in units of milliliters. An analog vacuum gauge and volumetric rotameter are provided on the unit to confirm electronic readings. The flow rate for purging and/or sampling using the flow controller will be preset at a rate of 200 ml/min. Total purging and/or sampling volumes and vacuums will vary depending on the volumes of the specific sampling locations and the vacuum present in the well to be sampled.

In order to maintain the integrity of collected samples and to avoid potential cross-contamination of samples that may come in contact with the vacuum pump, all samples will be collected upstream from the programmable vacuum pump using a soil vapor vacuum box. Figure 4-2 provides a schematic illustration of the sample train including the programmable pump and soil vapor vacuum box. The vacuum box operates on the principle that as ambient pressure air is evacuated from the sealed box, the vacuum generated around the sample bag induces vapor flow into the bag without contacting any pumping device.

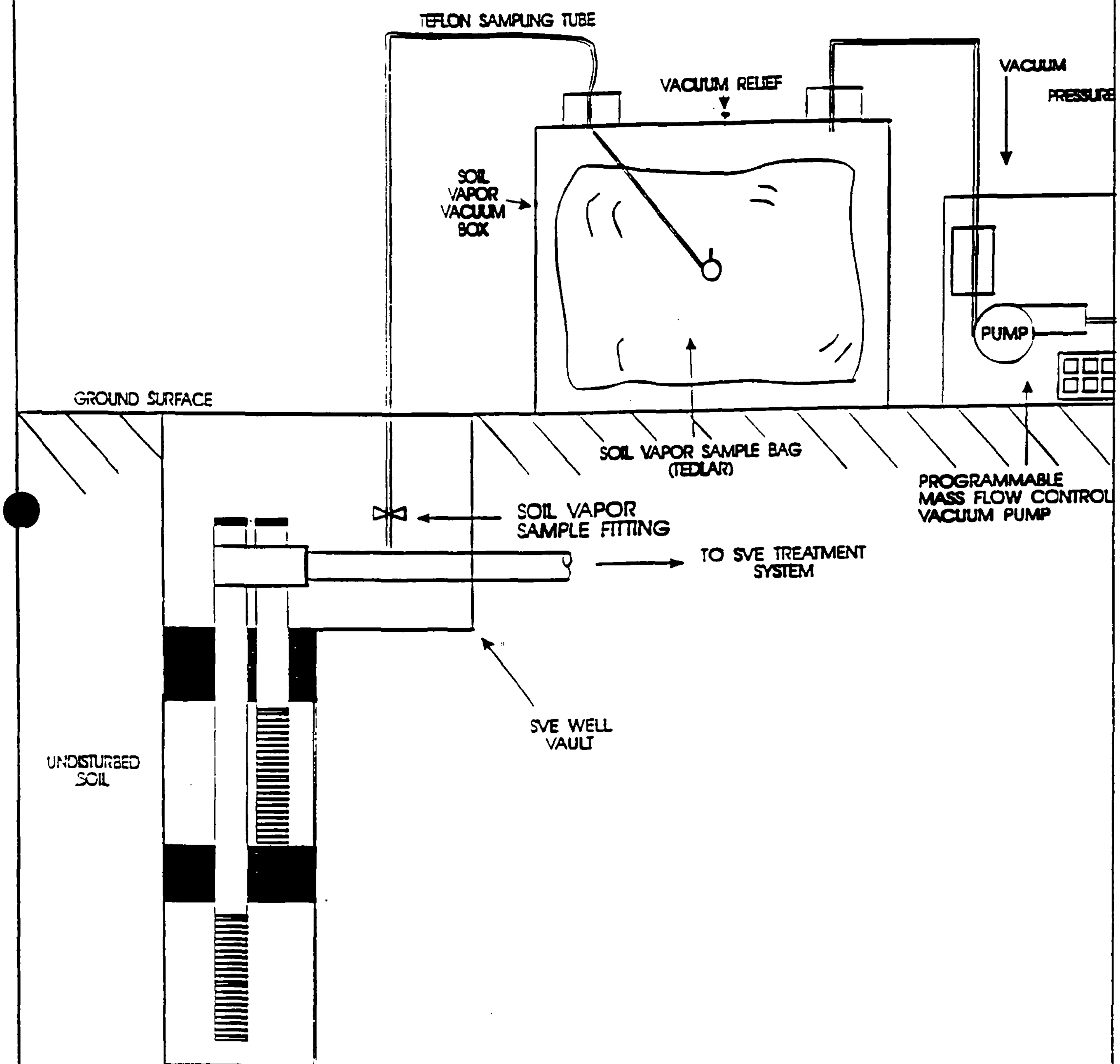
The rate at which air is evacuated from the vacuum box is equivalent to the rate at which soil vapor flow is induced into the sample bag. As previously stated, the programmed evacuation rate will be set at 200 ml/min as defined in the November 25, 1992 SVE Final Design. When



Source: IDC (1991)

FIGURE 4-1

Schematic of Programmable Mass Flow
Controlled Vacuum Pump



SVE SYSTEM WELL SAMPLING SCHEMATIC

M&E Metcalf & Eddy

Drawn by: J. Weidmann	Job Number: 006791	Date: September
Checked by: S. Zachary		Figure Num 4-2

the sample bag is filled, the sample inlet line is turned off between the source and the sample bag, the vacuum release valve on the vacuum box is opened, and the valve on the sample bag is closed, ending the sampling event. All tubing connections utilize stainless steel swage-lok fittings and new, 1/4-inch Teflon tubing. All used segments of Teflon tubing are replaced with new segments following each sampling event.

4.3 SOIL VAPOR SAMPLING - (FIELD MONITORING)

This section describes the methodologies that will be employed to collect soil vapor samples from the SVE system for routine monitoring and for evaluation of when to commence rebound sampling.

4.3.1 Pre-sample Purging

Prior to collecting samples, all soil vapor sampling locations are initially purged of static air residing in the sampling system. Drawing M-3, Detail 8, Appendix A provides sampling locations on SVE extraction wells, and Drawings E-2 and E-3, Appendix A provide sampling locations on the SVE treatment systems. In the case of SVE extraction and monitoring wells that have been switched off, static air is calculated as the open area of the targeted well.

The formula used to quantify this volume is as follows:

$$V = \Pi r^2 h$$

Where:

V = Volume of well (cm^3)

Π = 3.1416 (unitless)

r = radius of well (cm)

h = height of well (cm)

In the case of SVE treatment system locations, since sample will commence when the system is running, no soil vapor pre-purging is necessary due to the absence of static vapor (e.g. extracted vapors will be dynamically flowing).

The sampling methodology for SVE wells that have been switched off consists of initially purging two well volumes using the programmable vacuum pump or until peak VOC concentrations occur, whichever comes first. During purging, VOC concentrations are continuously monitored and recorded using a photoionization detector (Photovac Microtip 200, or equivalent) positioned at the exhaust port on the purge pump.

4.3.2 Soil Vapor Sample Collection (Field Monitoring)

Following purging, the sampling location is allowed to return to its ambient pressure reading (pressure prior to pumping). At this time, the programmable pump will be preset to collect a 3-liter (3,000 cm^3) volume sample at a flow rate of 200 ml/min. The soil vapor vacuum box is incorporated into the sampling train as shown in Figure 4-2.

A 3-liter capacity Tedlar bag will be positioned inside of the vacuum box and the bag valve will be opened after pre-evacuating the sample tubing. Sampling will commence by evacuating the vacuum box with the programmable mass flow controlled vacuum pump instrument. The pump controller will be set at a pump rate of 200 ml/min, with a pre-set vacuum at least 20% greater than the vacuum measured in the system to be sampled. Following sample collection, the pump will be turned off and the sample bag valve closed.

Field monitoring samples will be screened in the field using a photoionization detector (PID). The PID instrument will be calibrated using a mixture of gaseous TCE in ultra-zero air. All field monitoring readings will therefore be recorded in units of ppmV as TCE. Readings will be taken by connecting the PID inlet hose to the Tedlar bag outlet valve, and recording the maximum value in the field logbook.

4.4 SOIL VAPOR SAMPLING FOR REBOUND (LABORATORY ANALYSIS)

This section describes the methodologies that will be employed to conduct periodic rebound monitoring on SVE monitoring cluster wells for CLP laboratory analysis and subsequent VLEACH and Mixing Cell Screening.

4.4.1 Presample Purging

Prior to collecting samples, all SVE operable unit monitoring well locations are initially purged of static air residing in the sampling system. Drawing M-3, Detail 8, Appendix A provides sampling locations on SVE extraction wells, and Drawings E-2 and E-3, Appendix A provide sampling locations on the SVE treatment systems. The static air volume is calculated as the open area of the targeted well. The formula used to quantify this volume is as follows:

$$V = \Pi r^2 h$$

Where:

V	=	Volume of well (cm^3)
Π	=	3.1416 (unitless)
r	=	radius of well (cm)
h	=	height of well (cm)

The sampling methodology for SVE wells that have been switched off consists of initially purging two well volumes using the programmable vacuum pump or until peak VOC concentrations occur, whichever comes first. During purging, VOC concentrations are continuously monitored and recorded using a photoionization detector (Photovac Microtip 200, or equivalent) positioned at the exhaust port on the purge pump.

4.4.2 Rebound Soil Vapor Sample Collection (Laboratory Analysis)

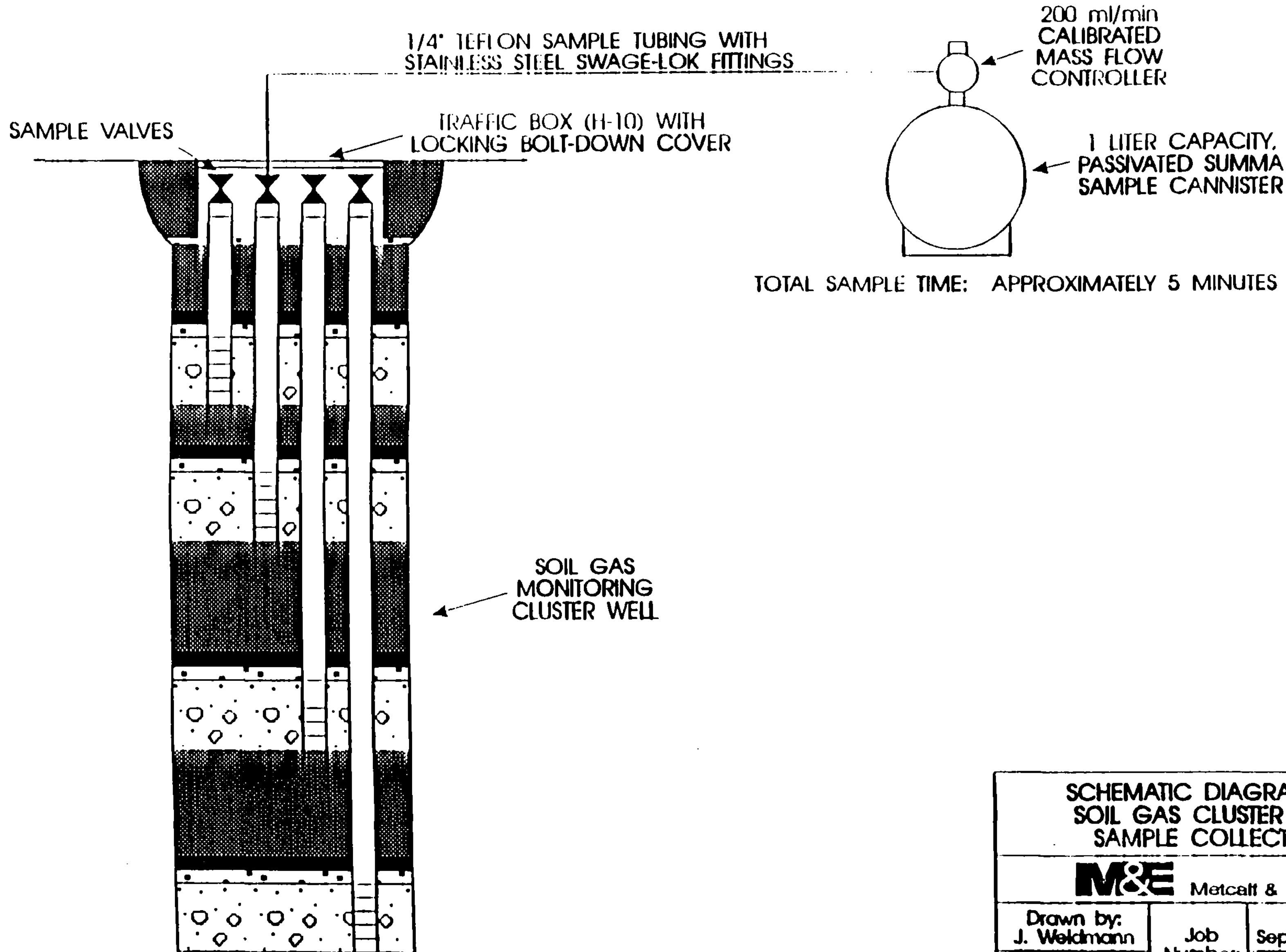
Following the purging protocol described in the previous section, the sampling location is allowed to return to its ambient pressure reading (pressure prior to pumping). At this time, the programmable mass controlled vacuum pump will be disconnected from the sample line and replaced with a pre-evacuated, stainless steel SUMMA canister. Figure 4-3 illustrates the sampling schematic for rebound soil vapor sample collection. To initiate sampling, the downstream end of the Teflon tubing will be attached to the intake of the field-calibrated mass flow controller mounted to the SUMMA canister (see Figure 4-3). After ensuring that all fittings are gas tight, the needle valve on the SUMMA canister will be opened to begin sample collection. Total sampling time will be 15 to 30 minutes which is sufficient duration to collect 3 to 6 liters of soil gas at a controlled flow rate of 200 ml/min. All used segments of Teflon tubing will be replaced with new segments following sampling.

4.5 SOIL CORE SAMPLING

Soil samples will collected at 5-foot intervals using a California modified split-spoon sampler. The split-spoon sampler will be advanced down hole at 5-foot intervals using a 140-pound slide hammer. Split-spoon samples will also be collected in 6-inch length, 2-inch diameter brass sleeves. Contiuous core samples will be collected during drilling where the 5-foot length core barrel positioned below the lead auger will fill as augers are advanced. Soil samples will be transferred from the core barrel into 6-inch legth, 2-inch diameter brass sleeves. Soil core samples will be prepared by placing Teflon sheets over each exposed soil face and secured in place with 2-inch diameter plastic end caps. An aliquot from one of the three brass rings from each soil sample will be placed in a 250 ml air-tight jar with a Teflon septa lid. The sample will be allowed to warm to ambient temperature for 30 minutes. After 30 minutes, a PID calibrated to TCE outfitted with a megabore syringe needle will pierce the septa lid and sample the sample head space. The peak concentration as TCE will be observed on the PID and recorded in the field log. Calibration of the PID will be checked every five samples or 30 minutes, whichever comes first.

4.6 DECONTAMINATION OF EQUIPMENT

Prior to each use and reuse all stainless steel mass flow controllers and swage-lok fittings will be oven-baked at a temperature of 105°C for at least thirty minutes. Nitrile or latex surgical gloves are worn during handling and assembly of the sampling apparatus. Following oven-baking, ultra-zero air or nitrogen will be used to flush the mass flow controllers for 5 minutes at a flow rate of 200 ml/min.



SCHEMATIC DIAGRAM OF
SOIL GAS CLUSTER WELL
SAMPLE COLLECTION

M&E Metcalf & Eddy

Drawn by: J. Weidmann	Job Number: 006791	Date: September 1992
Checked by: S. Zachary		Figure Number: 4-3

5.0 SOIL GAS ANALYSIS

5.1 SCOPE

This section covers the equipment, materials, and procedures used to determine the concentrations of various volatile organic compounds in soil gas. Phase I soil gas samples will be analyzed on site with a GC in a mobile laboratory setup. EPA Method TO-14 will be the analytical method for Phase II soil gas analyses. A summary of these field activities are contained in Table 5-1.

5.2 DETECTION LIMITS

Method detection limits (MDLs) are matrix dependent. For Tedlar bag soil gas samples, the MDL for GC analysis is estimated at 50 ppbV. For laboratory soil gas samples, the MDL is specified as lower than 1 ppbV (see Table 3-1A). The applicable concentration ranges of these methods are influenced by sample size and instrument limitations.

5.3 APPARATUS AND EQUIPMENT

5.3.1 Gas Chromatographs

For analysis of SVE operable unit field rebound soil vapor samples collected at clustered monitoring wells, a Hewlett-Packard 5890 Series II gas chromatograph (GC) will be configured with an electron capture detector (ECD) and a photoionization detector. It is anticipated that the GC will be operated with two injection ports, each connected to a capillary column. One 30 m X 0.53 mm ID (1.5 μm film) VOCOL column (Supelco 2-3731M) will be installed to the PID and a 60 m X 0.53mm ID (1.5 μm film) SPB-5 column to the ECD. One Dual Channel HP3396B integrator will be used to record detector response. Laboratory grade 99.999% purity helium will be the carrier gas and sweep gas for the PID, while nitrogen will be the carrier and makeup gas for the ECD. It is anticipated that the GC will be operated in the splitless mode.

Table 5-1
Summary of Soil Gas Analytical Activities

Parameter/Sample Type	Analytical Method	Targeted Analysis	Detection Limits	DQO Level
Phase I Soil Gas Survey	On-site GC # HP5890	IND*	50 ppbv	2
SVE Operable Unit Routine Field Monitoring	Hand Held Photoionization Detector	Total VOCs	1 ppmv	1
SVE Operable Unit Rebound Field Monitoring	On-site GC Photovac 10S70 (or Equivalent)	IND**	50 ppbv	2
SVE Operable Unit Rebound Laboratory Monitoring	Off-site Certified Laboratory EPA TO-14	TO-14 Full Scan	< 1 ppbv	3

EXPLANATION

IND* = Denotes quantitation of indicator parameters (TCE, PCE, 1,1-DCE, and 1,1,1-TCA

IND** = Denotes semi-quantitation of indicator parameters (TCE,PCE and 1,1-DCE)

Flow rates, temperature ramps, and column head pressures will be adjusted to maximize chromatographic separation. Once the operating conditions are established, all subsequent analyses will proceed according to the set parameters. All operating conditions, including temperature programming information, gas flow rates, column head pressures, attenuation settings and PID voltage settings will be recorded in waterproof ink in a sequentially bound laboratory notebook. Additional information, including instrument serial numbers and types will also be recorded in the notebook.

5.3.2 Calibration Criteria

Calibration standards will be obtained from commercial sources (Scott Gases or equivalent). A measured volume of the standard mixture will be transferred into a new 3-liter capacity Tedlar bag to account for matrix effects of sample collections. The bag will be heated to achieve volatilization and mixing of the standards. For Tedlar bag analyses, a measured volume will be directly injected into the GC using a gas-tight syringe. The calibration standard will contain as a minimum the following:

- 1,1,1-Trichloroethane
- 1,1-Dichloroethene
- Trichloroethene
- Tetrachloroethene

The initial calibrations will use at least three different concentrations expected to bracket the concentrations of the samples. The linear regression coefficient for each analyte using the HP5890 GC will be greater than 0.99 or the calibration must be repeated.

Quantitation of sample concentrations will be performed by using the external standard technique, i.e., comparing instrument response against the initial calibration curve.

5.3.3 Continuing Calibration

At the beginning of each day, or every twelve hours, a continuing calibration in concentrations at mid-range of the initial calibration curve will be analyzed. The measured concentration, as determined from the initial calibration curve, will not vary more than plus or minus twenty percent. In the event the twenty percent criterion is exceeded, a new initial calibration curve must be generated and the continuing calibration reanalyzed.

5.3.4 Quality Control

5.3.4.1 System Bank

A randomly selected Tedlar bag will be analyzed daily to demonstrate interferences from the sampling device or the analytical system. If interferences are found at unacceptable levels, the contents of an unpacked cartridge or a new Tedlar bag will be analyzed to determine if the interference is due to the sampling device or to the analytical system. Appropriate measures will be taken to eliminate such interferences.

5.3.4.2 Field Blanks

Prior to each days soil gas or atmospheric sampling, field blanks of the entire sampling apparatus will be taken and analyzed to check background contamination in the sampling system. Tedlar bag samples will be obtained by drawing air through the sampling apparatus and collecting an aliquot for analysis. Additional field blanks are collected prior to any reuse of recleaned sampling equipment.

5.3.4.3 Duplicate Samples

Duplicate soil gas, or atmospheric, samples are collected from each sampling location. Duplicate analyses will be performed on at least 10% of the samples collected.

5.3.4.4 Trip Blanks

An unused Tedlar bag will be transported into the field with the sampling equipment. The trip blank is returned to the lab with the other samples and analyzed. If VOCs are detected, sample handling and transport procedures are subsequently reviewed.

5.3.5 Sample Handling

When each sample arrives in the mobile laboratory area the cartridge or bag number and the arrival time will be entered in waterproof ink in a sequentially numbered bound laboratory notebook. The injection number, as it corresponds to the chromatogram number from the integrators, will also be entered.

5.3.6 Records

The laboratory notebook will include all information necessary to trace analytical work, including sample calculations, injection order, sample numbers, instrument parameters, and any and all deviations or variances from the standard protocols. Observations of extraordinary circumstances will also be noted. The analyst's name will appear at the top of each page, the words "continued to page" and "continued from page" will be added along with the appropriate page number. A table of contents will be constructed at the beginning of the notebook. Chromatograms will remain in a continuous roll throughout the day and the sample ID added. If a roll of paper is torn or a new roll is used, an explanation will be included at the beginning. The integrator sample number, time, and date will be checked each morning and verified by entry into the laboratory notebook.

6.0 SVE TREATMENT SYSTEM STACK SUMP

This section describes the sampling and analytical methodology for monitoring the SVE treatment stack sump liquids.

6.1 STACK SUMP SAMPLING

The sampling location for accessing the SVE treatment stack sump valve is illustrated on Drawing 84-E-3, Appendix A. The stack sump is positioned below the SVE treatment stack. A valve is positioned at the terminus of a one-inch diameter steel line running from below the sump. Periodically, the valve will be opened to inventory and record the presence of liquids in the line. If required, sampling will be carried out by filling 40 milliliter capacity VOA septum vials (2 quantity) from the drain line valve. The samples will be appropriately labeled, preserved, packaged and submitted to a CCP laboratory for VOC analysis. See Table 3-1 and Section 3 of this Appendix. Any water present in the sump will be transferred via pump to a tank truck for transportation to the Subunit A groundwater treatment system for treatment prior to disposal.

APPENDIX I

U.S. EPA POLYGON 84 NEGOTIATION CORRESPONDENCE

SHARP AND ASSOCIATES, INC.
Environmental Engineers and Scientists

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Columbus, Ohio 43229
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November 1, 1993

Mr. Craig Cooper
Remedial Project Manager
U.S. EPA Region IX H-7-2
75 Hawthorne Street
San Francisco, CA 94105

Subject: Designation of Polygon 84 as the Next Soil Vapor Extraction (SVE) Polygon to Be Remediated
Phoenix-Goodyear Airport Site - Goodyear, Arizona

Dear Mr. Cooper:

As we discussed in our meeting on October 19, 1993, it is more cost-effective and timely to remediate Polygon 84 using the operating soil vapor extraction treatment system that is in place at Polygon 79. The system can be used to remediate Polygon 84 without moving the equipment from its current location in Polygon 79. Selecting a polygon other than 84 for the next one to be remediated would require moving the treatment system to the west side of the railroad tracks. At some point in the future, the system would have to be moved back to the east side of the tracks to remediate Polygon 84. Designating Polygon 84 as the next one to be treated reduces the number of moves of the SVE treatment system, reduces the amount of design and installation to be required for Polygon 84, and potentially accelerates the completion of the overall SVE remedy by reducing the number of moves of the treatment system.

Goodyear will proceed with the design for Polygon 84. The design will be submitted as an addendum to the existing design for Polygon 79. The design will be submitted 30 days after "Initial Rebound" on the last sub-area in Polygon 79. The substantive part of the design for Polygon 84 is included in the already-approved design for Polygon 79 (November 25, 1992). The additional Polygon 84 design components are the locations of extraction and monitoring wells within Polygon 84 as well as design of the piping from the proposed wells to the existing treatment system.

If you have any questions, please call Ed Waltz concerning scheduling issues or Scott Zachary for details on the items to be included in the design.

Sincerely,
SHARP AND ASSOCIATES, INC.

Todd Struttmann

Todd Struttmann, P.E.
Project Manager

TJS/

cc: E. Waltz, Goodyear
S. Zachary, Metcalf & Eddy, Inc.

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